Pre-fabricated Speech Formulas as Long-term Memory Solutions to Working Memory Overload in Routine Language

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by lic. phil. Claudio Hartmann

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"If the brain were simple enough for us to understand,
we would be too simple-minded to understand it."

Anonymous
Sidney Lamb 1999, Chapter 16

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I also acknowledge that the creation of an acknowledgement page is without any negative connotation an extremely formulaic affair – and here we are, in the middle of the subject matter.

1 PREFACE

"Speech production has been studied less than language comprehension because of the difficulty in controlling the input (our thoughts)."
Harley (2008:448)

1.1 Abstract

This doctoral thesis attempts to integrate natural data evidence of a complex linguistic phenomenon into an interdisciplinary theoretical framework in order to corroborate a long-standing belief in the linguistic literature about the working memory load reducing effects of speech formulas in routine language. A statistical analysis of indicators of cognitive load in speech output is conducted for the dual task of visual event narration in sports commentary and checked against the comparative data of free speech elements within the same transcripts.

1.2 Motivation

> "[…], the shyness of linguists about investigating the mind has been so tenacious, and the mind so elusive, that even today most linguists have changed their analytical methods hardly at all, even while professing an interest in the mind." (Lamb 1999: 5)

The current state of linguistic research into formulaic language leans towards pure descriptive corpus linguistics. We can find various and extensive studies on a number of aspects of formulaic language, such as sentence structures, recurring patterns, lexical selections, etc. in different communicational settings and a general consensus can be found in the assumption that to a certain degree formulaic speech somehow eases the burden on working memory during speech production. However, the *somehow* and *to a certain degree* in the previous sentence are exactly the two points that one does not find many further details about in those studies.

One explanation why research hardly goes over the boundaries of descriptive corpus linguistics may be attributed to Sidney Lamb's observation quoted above. Most contributions to the neurocognitive or psychological aspects of this subject matter derive from neurologists or cognitive psychologists with a special focus on language – and not from linguists with an interest in the neurocognitive background of language. Therefore, some fundamental questions remain somewhat sketchy and unsatisfactorily answered: Why would there be a working memory overload without the use of formulaic language in the first place? Which mental processes that require working memory resources are bypassed with the use of speech formulas? How are entire speech formulas retrieved from long-term memory for the immediate use in speech production?

An interdisciplinary approach can help bridging the existing gap with the implementation of results from corpus linguistics into memory frameworks that have been established in neurocognitive science as well as cognitive psychology and proven applicable for language research.

1.3 Aim and scope of the research

The main aim of the current research is to corroborate the hypothesis that speakers under some sort of working memory pressure deriving from cognitive tasks other than speech production itself can make use of pre-fabricated speech formulas in order to maintain a fluent and task-specifically effective speech. Such formulaic speech can be observed in typical dual task environments, where the speaker is engaged in another cognitive task in addition to language production that requires attention and mental resources. In the current context dual task refers to a very specific activity, consisting of an input mode that differs from the output mode, as in visual stimulus input and verbal narration output. However, within such a dual task a subject might have to perform multiple sub-tasks within one mode, as in watching a scene and reading a caption of it (as two different visual input stimuli) or narrating the scene and writing short notes about it (as two verbal outputs). So, even though multiple tasks are involved the term dual task will be used in this context to refer to two differing input and output modes.

Several authors (i.e. Kuiper et al., Pawley, and Bowcher) have observed elements of formulaic speech in oral traditions, where at least some degree of routine is required, and mention examples such as the recitation of bible verses and songs, and the telling of fairy-tales or short stories. We can expect formulaic speech in most routine context, even in everyday small talk. However, the authors also point out that formulaic speech is found at a significantly higher frequency and explicitness in a routine speech environment that, in addition to production of speech itself, puts a heavy extra burden on the speaker's cognitive capacities. Job profiles such as those of auctioneers (Kuiper 2000), aerobics instructors (Kuiper and Lodge 2004) or sports commentators (Pawley 1991, Kuiper 1991, Delin 2000, Kuiper and Haggo 1985) proved to provide a very suitable environment for the research of formulaic speech.

The explanation for this observation lies in the intensity of the dual task that is performed. Auctioneers for example use their language to animate potential buyers almost in the style of an entertainer, but they also visually monitor the latest bids and verbally inform the audience about the current prize level of the object for sale. Aerobics instructors do not share the same specific tasks as auctioneers, but they are also engaged in a dual task of several concurrent cognitive activities. While physically executing their own instructions as role models, they constantly communicate the next steps of the exercises in a cadence that mirrors the rhythmic patterns of the drill, and additionally, they visually monitor the participants, evaluate their moves and are expected to give correctional advice by means of language.

The most complex dual task job, however, appears to be the one of the sports commentator, because the coverage of a live televised sporting event, for example, puts extra time pressure on the speaker. While the commentator who is narrating the live action visually observes new and ongoing events, he or she must also remember recently passed events and make a selection of new actions that are to be formulated and finally uttered. All this should be achieved at a relatively high speed in order to match the streaming images on television and to fulfill the expectations of a real-time coverage. Despite sports commentary's explicitness of dual task features, all of the above mentioned sample speech situations show multiple cognitive activities that are to be executed concurrently.

A first sub goal in the theoretical foundations of the current research will focus on the working memory burden that comes along with the dual task of a sports commentator. The scope is restricted to the effect that visual stimuli that are to be processed, remembered and verbally communicated have on working memory and consequently on the speaker's linguistic performance. A thorough theoretical foundation is expected to support the assumption that a constant flow of incoming visual stimuli that a speaker has to conceptualize, formulate and finally articulate can affect speech output negatively, due to the high demand on the shared pool of processing resources of working memory.

These assumptions and their implications necessarily lead to the second sub goal - the real quest of finding explanations for the established claims in the literature and first impressions of listening to the data: How is it possible for sports commentary, as chosen example of a routine context dual task, to produce an almost photographic narration of events on a relatively steady articulation rate? How can it achieve a higher speed than for example everyday conversations? Why does it appear that there are fewer hesitation phenomena or disfluencies in play-by-play commentary than one would expect in such situations where working memory capacity reaches its suggested limits due to another concurrent cognitive task? Such characteristics are the most striking ones we would expect from a diminished speech output quality in language production under a heavy cognitive load.

A thorough corpus analysis of sports commentary transcripts in the core analysis part of this paper will serve to clarify whether these impressions and conclusions by several authors, such as Kuiper et al., Pawley, and Bowcher for example, are indeed supported by statistical results. This will be done by comparing several indicators of speech under high cognitive load between the dual task part of sports commentary (the play-by-play visual event narration) and the control data of the non-activity-tied freely spoken part (color-commentary).

Kuiper and Flindall (2000:284) mention in their study on memory constraints and routine context that pre-fabricated speech formulas "could be a factor in providing an explanation of the way in which speech is matched with context", and conclude that formulaic speech may be a response to the kinds of constraints a speaker is subjected to.

Therefore, to bridge the theoretical foundations with the core analysis the thesis takes a close look at the routine setting in which sports commentary is produced as well as the recurring events that create the necessary environment for formulaic language, in order to demonstrate pre-fabricated speech formulas at work by providing selected examples of discourse structures and finite-state grammars from the data. Furthermore, with the help of the previously established theoretical foundations, it should be possible to pinpoint almost exactly which aspects of the speech formulas save working memory resources in what respect.

The linguistic data, a detailed collection of self-produced transcripts, will be restricted to televised basketball commentary. By embedding findings from the data into the established theoretical background that will be developed during the first part, the dissertation aims at corroborating support for the hypothesis that speech formulas largely depend on the unlimited capacities of long-term memory, automatize language production to a degree that reduces the overall load on working memory's limited and shared capacity.

1.4 Hypotheses in brief

The research into pre-fabricated speech formulas and their influence on speech production is divided into two parts. First, some theoretical work in cognitive linguistics and neurolinguistics will serve as basis for the development of an own synthesized memory model in chapter 6 that illustrates the different contributions of working memory and long-term memory to speech production, especially with respect to visual event narration. The theoretical foundations should support the primary and underlying established claim about the nature and effect of sports commentary’s dual task:

> *A constant flow of incoming visual stimuli that are to be segmented, structured, selected and then further conceptualized, formulated and articulated puts high demands on the shared resource pool of working memory, and can overload working memory’s capacity to the extent that it affects speech production negatively.*

Once the theoretical framework is established the core analysis of the data corpus looks at specific indicators of cognitive load in speech production. It explains how the formulaic frameworks of the routine events with their discourse structures and sets of finite-state grammars can reduce the overall working memory load in a dual task for the support of the following hypothesis:

Pre-fabricated speech formulas retrieved from long-term memory bypass working memory to a degree that enables a relatively fluent and effective verbal coverage of the visual stimuli even under increased working memory load deriving from the dual task.

As mentioned in the presentation of the aim and scope of the research the present study will look at the above hypotheses in structurally separate but topically intertwined parts. For the purpose of an aim-oriented and well-arranged research paper the foci and contents of each chapter is presented in the following overview.

1.5 Chapter overview

This section will explain in more detail the general structure of the paper, and for some chapters the aims and procedures are stated as well. Chapters 3 to 6 build the groundwork for the research and are grouped together as THEORETICAL FOUNDATIONS in the paper. The analysis, implementation and discussion of the data in the second part include chapters 7 to 11 and build the linguistic CORE ANALYSIS.

SPEECH FORMULA PERSPECTIVES

As a part of the introduction into the subject matter of pre-fabricated speech formulas, this chapter reviews previous studies and highlights the different angles one can look at formulaic language. Not only linguists have shown an interest in formulaic language. A large number of research fields have so far contributed to the vast literature for this topic.

Along with the various backgrounds of researchers interested in speech formulas and oral formulaic traditions came an abundance of terms that require an overview and clarification, because they sometimes (although not always) refer to identical phenomena. Due to this partly author-dependent technical vocabulary usage a working terminology will be determined.

FROM VISUAL STIMULI TO SPOKEN WORDS

This first chapter of the theoretical foundations will introduce the subject of transforming a visually perceived stimulus into a phonological word ready to be uttered. As the data essentially show the results of a transformation of visually perceived inputs into a verbal coverage, it is important to understand the processes at work. Vision as lead-in process in the context of the sports commentary data corpus is discussed especially with respect to the characteristics as non-verbal input and dynamic domain description, because in terms of working memory load, these characteristics have a much greater impact than for example verbal content as input or static picture presentations.

Furthermore, a closer look at the core processes from conceptual preparation to articulation is expected to give us a clearer understanding of how much mental work has to be done on the pathways of a visual stimulus towards articulation, and how many individual transformative steps are required to achieve the final product. In another step, the role of memory during the transformation of a visual stimulus into a phonological word is illustrated.

WORKING MEMORY OVERLOAD

There is a consensus among researchers of formulaic language, that the frequency of the use of speech formulas is significantly higher in environments where the speaker is exposed to other cognitive tasks that use working memory resources as well. In order to follow this argument, the concept of working memory has to be defined first. Two established working memory models by Alan Baddeley and Nelson Cowan are compared for that matter. Both models appear fundamentally different at first sight. The "multiple-component model" (Baddeley and Logie 1999) seems more graspable for a focus on language while the "embedded-processes model" (Cowan 1988, 1999) gives more details on the pathways of stimuli during processing. However, the discussion of Miyake and Shah (1999b) will help to define a theoretical consensus across not only these two models, but others covered in their volume as well.

After working memory has been defined, the next section is dedicated to capacity limitation. The actual contents of working memory and the measurements of memory capacity are explained. The argument here is that not every process involved in the transformation of a visual stimulus into a phonological word requires an equal share of the resource pool, and therefore the individual elements of language production requiring working memory resources will have to be elicited.

LONG-TERM MEMORY ADVANTAGE

If working memory capacity is limited, long-term memory must have an unlimited capacity, because the brain never reaches a point where it is "full" and no more information can be committed to it. Findings in dual task experiments (e.g. Intraub 1999), will clarify the advantages of long-term memory with respect to storage and retrieval of information.

Finally, a look at automaticity in language shows that many elements of speech that are uttered without effortful or conscious processing are to a certain degree formulaic. Importantly, these formulas can be created or learned and stored in long-term memory, where there is no known capacity limit, and later retrieved quickly for the use of verbalizing a conceptualized state, event or action.

SYNTHESIZING A LANGUAGE-ORIENTED MEMORY Model

The final chapter of the theoretical foundations attempts to draw a memory model that is suitable for the application in language research and that can serve as point of orientation in the argumentation of where speech formulas actually are able to operate. The ambition is neither to compete with existing models (of which some are introduced in chapter 3) nor to claim revolutionary findings, but to visualize the theoretical consensus that emerges from the preceding chapters with comprehensible step by step diagrams. An embedded structure is chosen, similar to Cowan's model, but all aspects of consensus and elements described in the chapters 3, 4 and 5 are considered.

SPEECH PRODUCTION UNDER INCREASED COGNITIVE LOAD

The effects of high cognitive load on the quality of language are the focus of this chapter. A main focus will be on the three components of speech production introduced by Levelt (1989), to elaborate further on which processes within the conceptualizer, formulator and articulator would be most affected by a working memory overload.

An audience would notice such a working memory overload because language quality on several levels suffers. A complete breakdown of speech production is not likely, but there most certainly are indicators and symptoms that occur with an increased frequency and high cognitive load. Berthold and Jameson (1999), for example, have collected a list of such indicators that describe the output quality, output rate as well as the amount and duration of filled and silent pauses. For most of the indicators a number of independent studies by various authors are in agreement about the tendencies of frequency or duration under working memory load.

PINNING DOWN SEMI-PRODUCTIVE SPEECH FORMULAS

In order for formulaic language to operate Kuiper and his associates point out that there exist a number of prerequisites. There can obviously not be routine language without a routine context, for example. This chapter will look at the criteria necessary for not only the formation but also retrieval of speech formulas that are stored in long-term memory and provide direct evidence from the data to visualize discourse structures constituents and finite-state representations of semi-productive speech formulas.

A second step will then point out where there is potential to reduce working memory resource demand during the process of transforming visual stimuli into a visual event verbalization. Finally, it will be elaborated where and how exactly semi-productive speech formulas can tap this processing reduction potential.

CORPUS RESULTS AND IMPLICATIONS

In this chapter of the core analysis the introduced indicators of increased cognitive load in speech production are coded and analyzed both in the more working memory resource demanding play-by-play type of sports commentary and in the non-activity-tied free part of color-commentary, in order to produce statistical evidence on whether the highly formulaic play-by-play commentary shows noticeably fewer indicators of cognitive load or not. A comparison between the results of both commentary types then allows for a conclusion on whether the working hypothesis of this research paper is supported in the date or not.

SPORTS COMMENTARY DATA CORPUS

Although not absolutely mandatory, some knowledge of sports commentary is extremely helpful in understanding some of the line of thoughts in this dissertation. Therefore, an excursion into the purpose, manner and speaker-audience relationship of televised sports commentary is provided at first in order to show how sports commentary has to be situated as linguistic data.
As an introduction to the data corpus itself, which consists of six transcripts from different basketball games broadcast live on television, the methodology of the transcription process is explained and the transcription conventions used are listed in a glossary.

2 SPEECH FORMULA PERSPECTIVES

"Perhaps it is a good thing that 'formulaic language' has not become a field in itself, a specialised branch of linguistics."
Pawley (2007:32)

2.1 Introduction

After many years of research on speech formulas Pawley (2007) offers an overview of the developments in the study of formulaic language. His extensive discussion helps in many ways to establish a useful background for the current research, because not only have there been a magnitude of different terminologies for formulaic language during the past decades, but also a variety of academic fields showing an interest in pre-fabricated language.

The current chapter therefore attempts two things at a grass-roots level. First, a brief historical excursion into the research of speech formulas shows how large and interdisciplinary this "linguistic" phenomenon has always been and where in this ocean of studies the current research needs to be located. Second, some of the major claims that have evolved in this designated area are recapitulated to serve as starting point for the theoretical foundations of the thesis and to highlight the very foundation of the research questions and hypotheses.

2.2 Fields of research with an interest in formulaic language

Pawley's quote in the beginning of this introductory chapter implies that successful research into formulaic speech should be conducted with a wide focus, taking into account previous work from other disciplines, including models and methodologies. His statement can be justified from two perspectives. First, formulaic language is by far no new phenomenon, but one that has for decades been tackled by a variety of research traditions separately, especially before the 1970s. Second, a modern linguistic research agenda on formulaic language needs to be multidisciplinary in its nature, following Wallace Chafe's (1996:49) call for an interdisciplinary model of natural discourse that combines the diverse cognitive and pragmatic factors that are responsible for the shape of language.

In a look back at the history of formulaic language research it may surprise that some of the earliest detections of speech formulas were made by neurologists such as Paul Broca in the 1860s, followed by many scholars of neurology and neuropsychology who eventually formed the tradition of using both spoken and written language as a "window to the mind". Their data mostly derives from aphasic or brain-damaged patients and serves to explain the phenomenon of aphasic people retaining a sort of automatic speech while losing the ability to speak more creatively. Recognizing the benefit of language as an observable and manipulable input and output in experiments of brain studies neurologists and neuropsychologists maintained a high interest in language and linguistics, leading for example to the establishment of the scientific journal *Brain and Language* devoted exclusively to this interdisciplinary interface.

Another branch of research with an interest in formulaic language can be found in literary studies. Pawley (2007:5) highlights the works of Milman Parry in the 1920s and his scholar Albert Lord (1960). Their studies in Homeric poetry and the traditions of reciting and performing large pieces by singer-composers that were not literate led to the assumptions that such oral traditions apply some sort of “language paradox” that can be memorized as large chunks while still be amenable for creative variations.

With similar data but a different research background and motivation anthropologists and folklorists looked at song and speech rituals introducing more core linguistic elements into their research than the literary scholars. Pawley (2007:6) mentions Malinowskis (1935) ethnographic account of New Guinean incantations. His thorough analysis and discovery of fixed formulas with partly idiosyncratic meaning, special intonation patterns with distinctive rhythm and pitch established something of a table of characteristics of formulaic speech that have since been focused on and complemented with a number of additional features. Many contributions by Koenraad Kuiper (e.g. Kuiper 1996, 2009) and his co-authors restate these characteristics as particular elements of modern routine language. By embedding established findings into new speech situations such as livestock auctions (Kuiper and Haggo 1984) ice-hockey commentary (Kuiper and Haggo 1985), horse-racing commentary (Kuiper and Austin 1990) or small talk at the supermarket checkout (Kuiper and Flindall 2000) they raised the awareness that formulaic speech is widely distributed not only in oral traditions but generally in routine language context.

Philosophers and sociologists studying language as an instrument of strategic social interaction, and eventually forming the linguistic branch of pragmatics, centered their attention on conventional expressions with a higher discourse than referring function. Pawley (2007:7) points out the works by Austin (1962), Searle (1969) and Grice (1975) focusing on standardized speech acts of greeting, apologizing, promising, naming, declaring a marriage, etc. This called attention to the high degree of formulaicity and dynamic of face-to-face talk, its dependency on sociological factors and the need to take this into account in discourse analysis.

In the middle of the 20th century psychologists began to investigate the differences in processing familiar versus novel word strings and brought the higher fluency and diverging hesitation phenomena patterns in connection with the so-called “chunking” of information that has been introduced by George Miller (1956) in his groundbreaking work *The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information*. It is this field of research that most elaborated on formulaic language from the point of view that speech formulas may be beneficent for language production under a high cognitive load, as the familiar pre-fabricated structures were assumed to be processed as large chunks instead of individual elements.

Besides the research fields from outside core linguistics showing an interest in formulaic language that have been mentioned so far, there have also been “core linguists” who dealt with pre-fabricated language material such as clichés, slang expressions, collocations and idioms. Pawley (2007:9) explains that recognizing those language phenomena challenged the syntax and lexicon boundaries of language models by established grammarians as much as they made the life of dictionary makers more difficult in their attempt to include multi-word expressions with non-compositional meaning into their works. Jesperson (1922) for example was one of the early grammarians to distinguish between free and fixed expressions, but Pawley adds that it was not until the 1960s before such semi-productive constructs found their way into grammars and accounts of semantics. Furthermore, he judges that the most successful attempts to implement formulaic language grammatically were achieved by phrasal dictionary makers aiming to provide foreign language learners with a set of building blocks that are easy to arrange and rearrange while maintaining a native-like way of saying things.

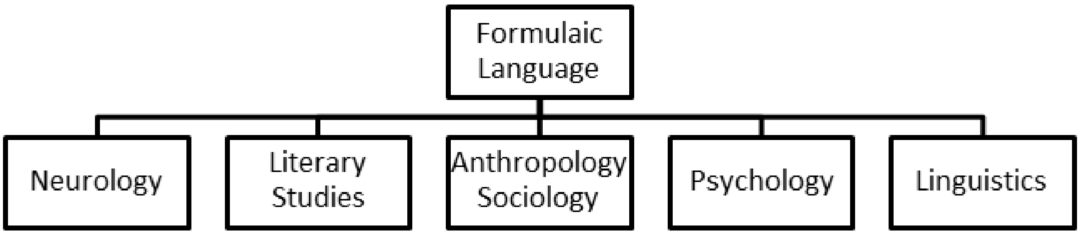


Figure 1 Fields of research with an interest in formulaic language
Although very different in their methodology and motivations, all fields have looked at pre-fabricated language in one way or another (Pawley 2007).

The five main fields of research with an interest in formulaic language from the historical excursion above are summarized in Figure 1. Obviously, these fields differ in their research motivation and each field would often also apply its own methodology. This leads to a vast amount of material available for the current research on the one hand, on the other hand it is easy to get confused by the subject-specific literature and lose the thread of the linguistic perspective.

2.3 Determining the terminology

Reading through a diversity of works on formulaic language it is difficult not to get lost in the jungle of terminology. Wray and Perkins (2000:3) found an abundance of expressions to describe phenomena that deal with speech formulas, listed in Table 1, but cautions that "while there is undoubtedly a certain measure of conceptual duplication, where several words are used to describe the same thing, it is also evident that some of the terms shared across different fields do not mean entirely the same thing in all instances". The chosen selection of nouns taken as field-specific terms, adjectives to describe properties of formulaic language, or compounds to describe formulaic phenomena should also be seen as a reflection of the different fields of research from which they originate.

Nouns	*Adjectives*	*Descriptions*
chunks	automatic	co-ordinate constructions
collocations	irregular	conventionalized forms
clichés	holistic	fixed expressions incl. idioms
gambits	nonproductive	complex lexemes
listemes	idiomatic	formulaic language
idioms	non-computational	formulaic speech
praxons	non-compositional	frozen phrases
schemata	non-propositional	frozen metaphors
rote		lexical simplex
amalgams		multiword items
composites		fossilized forms
holophrases		lexicalized sentence stems
gestalt		multiword lexical phenomena
formulas/-ae		lexical phrases
phrasemes		preassembled speech
petrifications		precoded conventionalized routines
routine formulae		ready-made expressions / utterances
		recurring utterances

Table 1 Terms to describe aspects of formulaicity (after Wray and Perkins 2008)

In her latest work on formulaic language Wray (2008:12) coins the term MORPHEME EQUIVALENT UNIT (MEU) and defines it as "a word or word string, whether incomplete or including gaps for inserted variable items, that is processed like a morpheme, that is, without recourse to any form-meaning matching of any sub-parts it may have". This definition is an addition to Wray's earlier working term FORMULAIC SEQUENCE (see Figure 2).

The difference between the two definitions by Wray is the holistically prefabricated nature of the newer expression. Whereas the formulaic sequence (definition 1 in Figure 2) includes also items that only appear to be prefabricated, the MEU (definition 2 in Figure 2) exclusively contains elements that in fact are prefabricated and stored holistically.

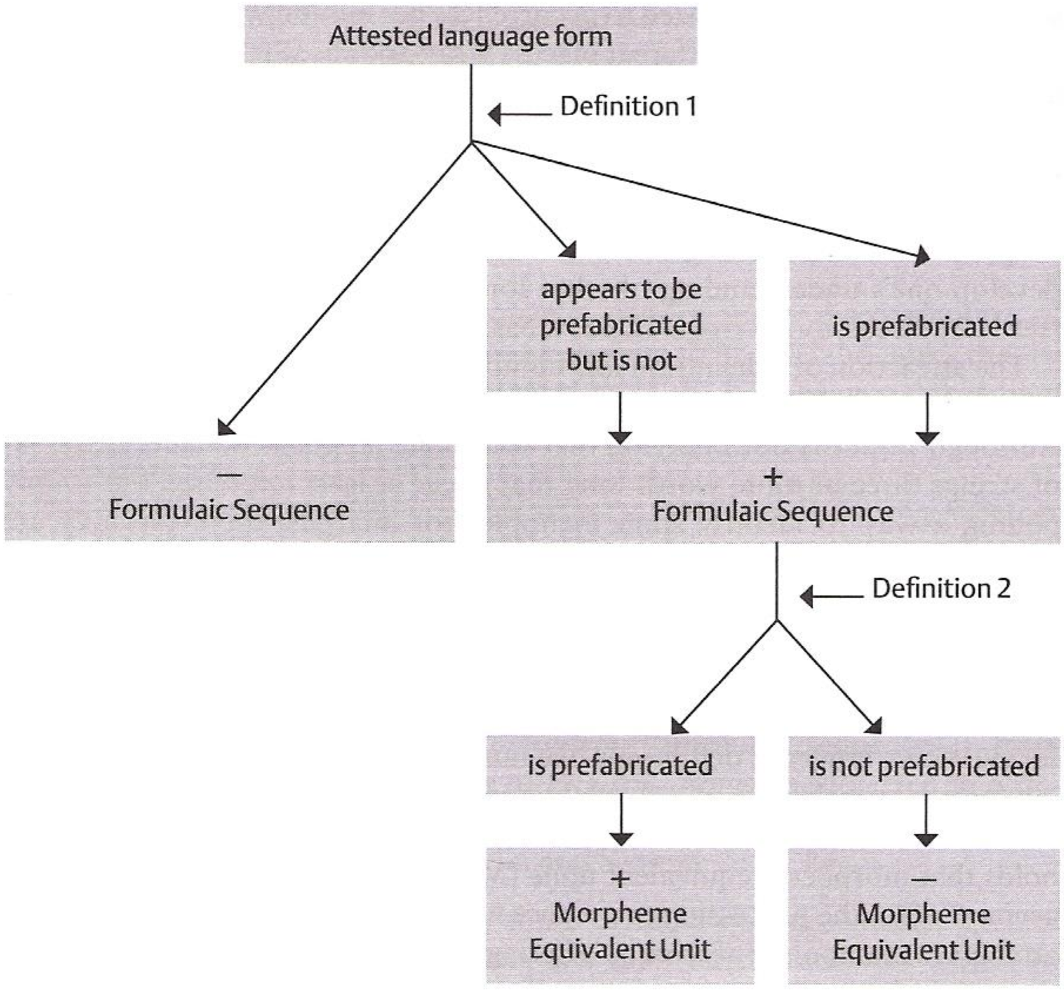


Figure 2 The relationship between the formulaic sequence and the MEU (Wray 2008)
Reproduced by permission of Oxford University Press from *Oxford Applied Linguistics: Formulaic Language* by Alison Wray © Oxford University Press 2008.

The criticism here is that what we essentially deal with is a verbalization that shows more or fewer characteristics of holistically stored and retrieved sequences. Corpus linguistics lacks the means to qualify an expression as prefabricated beyond any doubt, and therefore the ultimate decision on whether a formulaic sequence constitutes a morpheme equivalent unit or not would remain subject to speculation. On grounds of this argument, the earlier theoretical definition of a speech formula according to Wray (2002:9) as "a sequence, continuous or discontinuous, of words or other elements, which is, or appears to be, prefabricated: that is, stored and retrieved whole from memory at the time of use, rather than being subject to generation or analysis by the language grammar" is preferred for the analysis of the sports commentary data. It is also in accord with Kuiper's (2009) definition of formulaic sequences as phrasal lexical items (introduced in more detail in section 5.4.1) which he has previously applied in studies of sports commentary.

Support for the use of PHRASAL LEXICAL ITEM to refer to the multifaceted aspects of speech formulas comes from Schmitt and Carter's (2004) own quest for an unbiased term. They cite Kuiper's help in pointing out two underlying properties of the phenomena under investigation:

> "a) the units of formulaic language are not merely any sequence of words, but phrases, and
> b) they are lexical items exactly like other lexical items such as words, and with the same properties as words would have if they were phrases".
>
> (Schmitt and Carter 2004:4)

The authors agree with Kuiper's arguments and suggest that the logical terminology would be PHRASAL LEXICAL ITEM and PHRASAL LEXEME. However, "lexical item" and "lexeme" are not used interchangeably in all literature; lexical item is often employed as the cover-term to refer to a group of variations (lexemes). Schmitt and Carter anticipated that this distinction might cause a biased perception of the term, and decided to settle for another terminology despite their support for Kuiper's line of reasoning.

For the current research the decision has been made to choose a more neutral term to avoid too much dependence on Kuiper's or Wray's terminology that, although (or because) widely accepted and used, is still undergoing modifications and elaborations for the purpose of individual research papers. Since it is more helpful to explain exactly at what language phenomenon and subject matter we are looking at instead of hiding behind a terminology the expression SPEECH FORMULA is preferred and will be used throughout this paper. While the basic idea behind the here employed term corresponds to Kuiper's phrasal lexical item and Wray's formulaic sequence, a written out working definition for the analysis of the sports commentary data would be some sort of a blend of their spelled out definitions:

> *Speech Formula: A sequence or structure including gaps for variable content with an own entry in the mental lexicon that by activation is retrieved as a whole.*

It is important to note that this established working definition is not a guide of how formulaic speech can be identified in a data set. The theoretical foundation adopted from Kuiper (2009) and Wray (2002, 2008) merely serve to pinpoint the phenomenon and the material that is to be included in the analysis and discussion.

2.4 Locating the current research

During the last four decades linguistics has developed its own broad agenda into formulaic language. As Pawley (2007) points out the 1970s where the starting point of many research programs in this field that are currently still pursued by linguists. Therefore, in order to locate the current research, it is necessary to now get an overview of the linguistic approaches towards this subject matter.

There is one group of research foci that are concerned with the taxonomy and description of the language phenomenon. Another group can be subsumed as focusing on language use and change, as well as linguistic competence in connection with formulaic language. A third group attempts to design or modify theoretical models of language production and/or comprehension taking into account aspects of pre-fabricated and holistic language. Those three main areas described by Pawley (2007:13) cover most of the currently pursued goals of the linguistic branch of research with an interest in formulaic language.

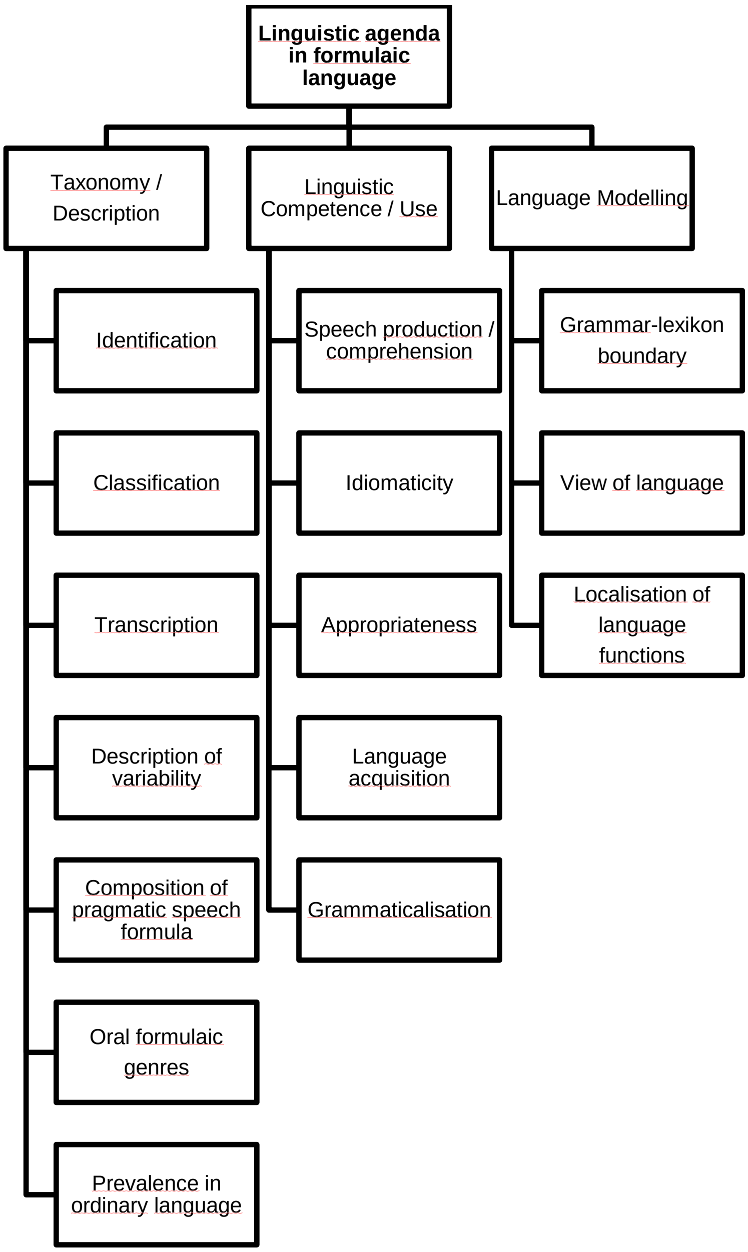


Figure 3 Linguistic agenda in formulaic language (after Pawley 2007)

To say it up front, it is not possible to highlight one particular box of Figure 3 about the linguistic agenda in formulaic language in order to locate this current research in its entirety, as it draws on theories and previous research from several areas, not only within the linguistic agenda in formulaic language but also of other disciplines. However, to narrow down the scope towards the previously stated hypotheses a helpful input comes from Wray's (2002:98) schema of how speech formulas help the interests of a speaker (see Figure 4). Looking separately at the aim of a speaker, the means that are prerequisite condition for it, the linguistic resources that exist as an option for the speaker, and finally the end product, makes it a bit easier to pinpoint the whereabouts of this project.

The speaker's aim, as defined by the nature of sports commentary serving as data corpus, is the verbalization of incoming stimuli. In most cases the stimuli under investigation will be of visual sorts with very few acoustic ones that cannot be ruled out. In general, however, the focus is set on vision as input mode. In order to explain the processes at work in stimulus perception and event conceptualization, and most importantly the burden on working memory deriving from those tasks, previous results and models from neurology and neurolinguistics (e.g. Findlay 2004, Hickok 2009, Crosson 1992, Field 2005) will play an important role.

As for the means for an efficient verbal coverage with the help of speech formulas, a routine setting of the visual stimuli is seen as a prerequisite in order to allow the speaker to activate and retrieve pre-fabricated and holistically stored material, because it is essentially the perceived and then conceptualized routine that triggers the lexical entry of a speech formula. For that matter research from cognitive psychology (e.g. Rummer 1999, Oberauer and Hockl 2000, Wolfe 1999) must be consulted.

The presentation of the hypotheses clearly stated the argument that speech formulas are believed to reduce the working memory load during langue production. Therefore, for the linguistic resources presented in Figure 4 only the lower pathway comes into consideration, in which the speaker has the choice between the selection of fixed speech formulas or semi-productive speech formulas. An explanation of the difference between the two categories of processing load saving linguistic resources in terms of the end product, as well as the reasoning behind the decision to center the focus on semi-productive speech formulas (as indicated by thicker borders) in the analysis are provided in the next sections.

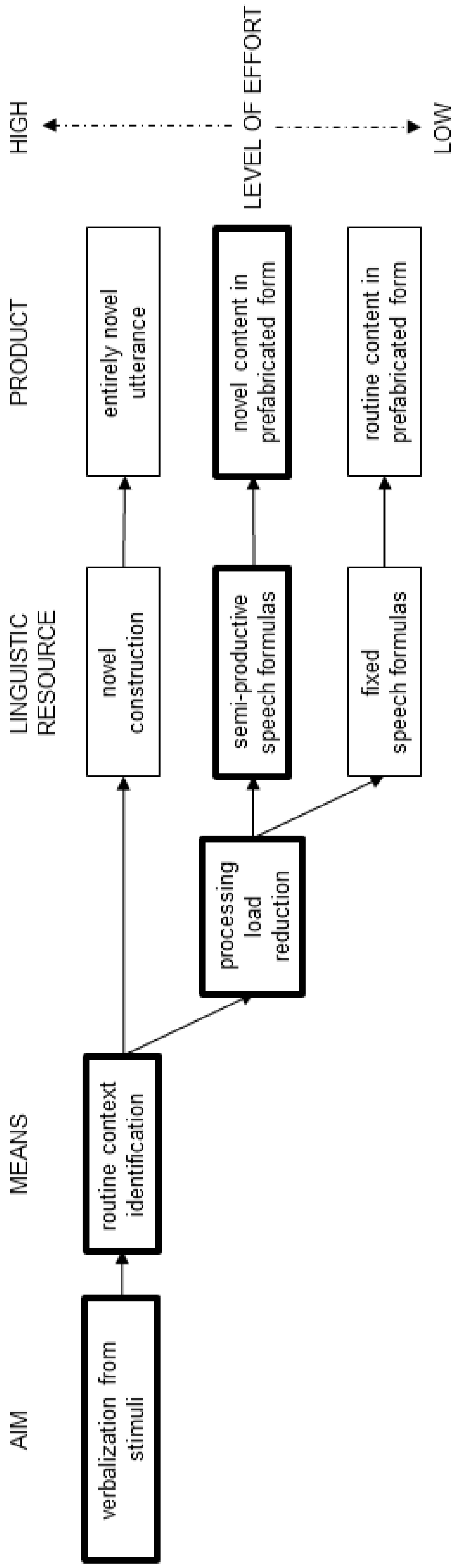


Figure 4 Speech formulas in the interests of the speaker (after Wray 2002)

2.4.1 Fixed speech formulas

The group of fixed speech formulas includes all routinized and memorized expressions that are presumably learned and stored in long-term memory as a whole and retrieved and used without being subject to (major) modification. A brief overview of recurring examples found in the sports commentary data are given in this section.

One category with the probably the least obvious formulaic character are pause fillers, such as *uhm, err*, because they do not carry semantic meaning. They are sounds rather than words but are so frequently heard in conversations that their pragmatic meaning could yield interesting support for the hypotheses. The fact that they entirely operate outside the speaker's conscious control or deliberate intention to utter them makes pause fillers good candidates for formulaic speech.

Numerals, in cardinal or ordinal form, also belong in this category on the grounds that they are the most automatized and prototypical means of relating to an abstract numeric value. Since numbers and values play a large role in the data, numeral speech formulas are assumed to benefit the speaker in terms of processing reduction.

Based on the same argument as for numerals, proper nouns are also included into the group of fixed speech formulas, as memorized prototypical lexical items for specific entities, such as persons and places that are automatically triggered after stimulus recognition. In comparison to the pause filler and numeral speech formulas, this category, consisting of nouns, shows more typical phrasal character, but is still easily identifiable because proper nouns usually consist of only a single word or a relatively short word string.

The three established categories so far are fully-fixed speech formulas, because they cannot be structurally modified during the process of grammatical encoding. Pause fillers, numerals and proper nouns are extremely short lexical items (most often one word or sound) and are therefore always built into an utterance as a holistic unit.

There are, however, two further categories that are treated as fixed speech formulas although they could be subject to modification at first sight. One category has been termed conventional and conversational speech formulas, including expressions that are routinized and typical for conversational settings. Some of them (e.g. *I think*) consist of personal pronouns and verbs and can therefore theoretically be modified in terms of tense or person, for example. Nevertheless, based on intuition (a legitimate tool to detect formulaicity; c.f. Wray 2002:20) it is argued that the conventional and conversational speech formulas are perceived as phrasal lexical items only in their fixed form and any modification would render them unformulaic.

The last established category, idiomatic speech formulas, is the broadest among the fixed phrasal lexical items and ranges from idiomatic single word expressions to larger phrasal verb constructions. Their idiomaticity is based on two parameters: field-specificity and idiosyncratic meaning. A single word, such as a technical term in a jargon, can therefore be idiomatic and fully-fixed similar to proper nouns. More extensive constructions, on the other hand, as for example *losing one's train of thought* are idiomatic in the sense of carrying figurative meaning, but can be modified (e.g. *I lost my train of thought, you've lost your train of thought*). This modifiability of the latter example threatens to blur the boundaries between the semi-productive and the fixed speech formulas. Still, the heavily restricted choice of alternative forms in an expression like *losing one's train of thought*, where the verb *loose* and the noun phrase *train of thought* cannot be substituted, leads to the inclusion of all idiomatic speech formulas into the group of fixed speech formulas.

The final product of a verbalization of visual stimuli by means of routine context identification and the selection of fixed speech formulas as a linguistic resource in order to reduce the processing load in working memory would be an utterance of routine content in prefabricated form, according to Wray’s scheme, whose constituents cannot be altered or modified during the process of speech production. Semi-productive speech formulas, on the other hand, allow for the inclusion of novel content in a pre-fabricated structure.

2.4.2 Semi-productive speech formulas

The main difference between fixed speech formulas and semi-productive speech formulas is that while the fixed ones are memorized items or strings of words, semi-productive speech formulas can be characterized as lexicalized pieces of syntax (Kuiper and Haggo 1985:170). They are equipped with open slots that the speaker can fill. However, since the retrieval of a semi-productive speech formula from long-term memory determines the syntactic structure of the utterance, the variables in the open slots are not free from linguistic conditions of use. As we will see later in section 5.4.2, where a sample of a formula stored in long-term memory (in particular a finite-state representation of a bid calling formula at auctions) is presented in Figure 21, the variables have a set place within the syntactic structure. The freedom that semi-productive speech formulas give to the speaker is the lexical choice within a given syntactic category (e.g. nouns or verbs). Haagort (2007: 256) notes that these constraints are not exclusive to speech formulas, as they partly apply in novel constructions as well, because every retrieval of a lexical item is also a retrieval of its syntactic role, which by grammatical rules limits the freedom of placing the lexical item randomly within a sentence or phrase.

Kuiper and Haggo (1985:173) point out that this kind of formulaic speech "is the response of the human speech encoding mechanism to short term memory loading in situations which are relatively predictable", providing not only the rationale for the current research hypotheses, but an important criterion to locate such speech formulas in the data. Similarly, Ferguson (1983:161) argues that it is our human tendency to routinize and conventionalize recurrent messages in recurrent communicative settings. The key to identify semi-productive speech formulas in the sports commentary data is therefore to look at event and action verbalizations of relatively predictable situations.

As a consequence, the precondition for semi-productive speech formulas is the existence of a recurring and routinized discourse structure with place-holders for the speech formulas. According to Kuiper and Austin (1990:209) each semi-productive speech formula is indexed for the use in a particular constituent of this discourse structure. Therefore, a verbalization of a routine event may consist of several successional speech formulas, or reiterations of the same speech formula with the inclusion of new variables.

To return to Wray's scheme once again, the final product of a verbalization of visual stimuli by means of routine context identification and the selection of semi-productive speech formulas as a linguistic resource in order to reduce the processing load in working memory would be an utterance of (to a limited degree) novel content in prefabricated form.

2.4.3 The decision for semi-productive speech formulas

It has briefly been mentioned at the beginning of this subchapter that after some consideration the decision has been made to set the focus for the analysis of the data only on semi-productive speech formulas and to exclude for example idioms, numerals and proper nouns as fixed speech formulas. Considering the last element of Figure 4 not yet mentioned, namely the level of effort for a speaker's working memory, it would be tempting to center the attention around the fixed speech formulas, because apparently those are the ones that require almost no mental effort during speech production and function almost automatically. One could therefore expect the most benefit for a speaker there, due to the largest processing reduction potential. Indeed, earlier trials of analysis have shown that fixed speech formulas play an integral part in the event verbalization of sports commentary. A brief look at some results from a previous analysis of idiomatic expressions in the data might give some insight.

Any field-specific language has its own set of idiomatic vocabulary for example – and the sports commentary data is no exception: It is peppered with technical terms, slang or clichés that require some knowledge from the audience to understand them. Wilson (2000: 149) suggests that while some of this specialist vocabulary is generic and familiar to a larger audience, much of it is even specific to individual sports. In terms of Kuiper's (2009:4) definition of phrasal lexical items, such technical terms have therefore very strong non-linguistic conditions of use. Roughly 7% of all words in the data are technical terms which belong to the category of highly field-specific vocabulary and are in most cases relatively short lexical items consisting of one to three words (e.g. *assist, goaltending, point situation, blocking foul, fall away jumper, three point play*). These terms emerged out of the need to have a simple lexical item to describe a rather complex routine action, state or event. By using such idiomatic fixed speech formulas rather than circumscribing the perceived scene in a novel fashion the speaker first of all speeds up the lexical choice process. As a consequence of narrowing and speeding up the lexical choice process by using one to three word fixed idioms instead of a longer novel description of an event, state or action, the structural complexity of the utterance is simplified. Therefore, the use of short idiomatic fixed speech formulas, such as technical terms, most certainly reduces the working memory load.

Nevertheless, this remains a fully theoretical assumption in the setting chosen for the current research. There are methodological barriers, because essentially there is no control group in the sports commentary data. It would be possible in a laboratory setting to record speakers narrating identical events, for example, and then conduct an analysis of a number of linguistic features and compare utterances where speakers made use of fixed speech formulas with utterances where speakers built novel constructions. This, unfortunately, is not possible with sports commentary transcripts, because, even though the detection of fixed formulas can provide interesting statistical information about their frequency and distribution, there can be no contrasting samples provided where the use of fixed speech formulas can be ruled out.

With semi-productive speech formulas for the verbalization of visual events, bearing in mind that the ones under scrutiny are tied to and triggered by routinized event conceptualizations, the expectation is to find contrasting results between play-by-play commentary, where the sports event is underway and vision-to-word transformation takes place, and the so-called color commentary, where the speakers do analyses and summaries during breaks and interruption of game action. The two commentary modes allow for an analysis of certain linguistic features with even partly the same speakers as control group in the two different communicational tasks: play-by-play commentary allows for semi-productive speech formulas triggered by event conceptualizations from visual stimuli while color commentary does not. A more detailed account of the purpose and manner of sports commentary in general, and of the individual communicational tasks in particular is provided in subchapter 10.1 of the sports commentary data corpus.

2.5 Summary

Formulaic language is not a recent phenomenon and has been dealt with for a long time by different fields of research. Neurology, psychology, anthropology and sociology, literary studies and linguistics are known to have looked at formulaic language with their own research agendas and methodologies for a long time, creating an abundance of different terms for partly identical phenomena.

The risk of following one particular terminology is that one remains somewhat bound to any further modifications and elaborations that it might be undergoing, and therefore, for the current research the probably most neutral term SPEECH FORMULAS is preferred. A working definition of a speech formula for the purpose of this dissertation has been formulated as *sequence or structure including gaps for variable content with an own entry in the mental lexicon that by activation is retrieved as a whole*, leaning on the definitions given by Kuiper (2009) and Wray (2008).

In order to locate the research within all disciplines and areas of research with an interest in formulaic language, the point can be made that the theoretical foundations are established with previous work in neurology and psychology - that is, outside core linguistics (see Figure 1). The core analysis, on the other hand, is situated in all three branches of the linguistic agenda in formulaic language (see Figure 3). As a description of an oral formulaic tradition it draws on the branch of description and taxonomy as well as speech production in general, which is part of the branch of linguistic competence and language use, and finally, the implementation of the findings into the theoretical background touches on the field of language modeling, as third branch in the linguistic research agenda.

3 FROM VISUAL STIMULI TO SPOKEN WORDS

"Vision exists in the present tense. It remembers nothing."
Wolfe (1999:86)

3.1 Introduction

Wolfe's quote above suggests that memory must play an important role somewhere on the road of a visual stimulus towards articulation. This chapter discusses the most important steps in the transformation of a visual stimulus into a spoken word and where memory mechanisms are at work.

Stimuli for language production perceived by vision can take many forms. One crucial differentiation is made between verbal content (e.g. written words) and non-verbal content (e.g. picture representations) of the stimulus. Non-verbal stimuli require several processing steps more for the generation of a spoken word. In other words, verbal material as input has a head-start compared to non-verbal material.

With respect to the present data of sports commentary, the focus is clearly set on non-verbal material as stimulus. Within this category, however, there is another important differentiation to be made. Non-verbal content description can refer to a relatively simple picture naming task that uses a static domain as input, as well as the verbalization of a highly complex event that consists of dynamic structures – a series or sequence of static domains so to speak.

Due to the nature and inherent task of sports commentary, the current research will focus on event descriptions. Habel and Tappe (1999:149) state that "in event descriptions the speaker has to face the same problems as in static domains *plus* some additional ones that are specific to dynamic structures." Consequently, the argument is that sports commentary, as basis for the current data, uses the most complex and most resource-demanding input form of vision.

3.2 Vision as lead-in process

If vision has no memory itself, it must at least have very close ties to the memory system, because, according to Wolfe (1999:87), the effects of a removed visual stimulus remain only for a short period of time. The duration of what he calls "fleeting visual memory" is estimated at about 100 milliseconds only. In order to keep this visual stimulus available for a longer time, and in the absence of the stimulus itself, every visual input that is to be processed further must somehow be stored in memory.

It is important to note already at this point that memory does not function with stored "symbols" for objects or any other representation, where a perceived stimulus would activate the adequate symbol to make it available for further processing. The human brain, as we will see in more detail in Figure 9, operates by means of neural networks and nection activation. Pulvermüller (2002:9) explains that all representations, including our entire linguistic system, have the form of such a network.

3.2.1 Non-verbal input

When a picture is given as stimulus in a picture-naming task the subject will first have to create a concept of it. A required mental process to do so is the visual object recognition, which can vary in quality, for example according to the degree of novelty of the stimulus. The conceptual preparation of the stimulus begins, once this stage of object recognition is completed, and will result in a lexical concept. A major difference to verbal input at this level of processing is presented by Levelt and Indefrey (2000:80). The "head-start" allegory of verbal input to non-verbal input can be explained with his comparison of the processes required in a word reading task, which shares vision as lead-in process: The stage following visual recognition in a verbal input scenario is not the formation of a lexical concept (that presumptively is inherent in a word), but directly the phonological code retrieval. In other words, reading a written word skips two mental processes compared to naming an object portrayed in a picture – conceptual preparation, and lexical selection are left out.

So far we have looked at one single stimulus that is to be articulated and the observations have led to the conclusion that a picture must be stored in memory for further processing steps. In a rapid succession of visual stimuli, however, by far not all stimuli are further processed, and therefore, presumably also not stored. In her study on visual scanning and memory, Intraub (1999:52) refers to Potter's (1993) work on short-term conceptual memory, where she states that unrelated pictures are only momentarily understood and then immediately forgotten. Intraub explains that this happens, because the conceptual processing of the successive picture disrupts consolidation in memory of the previous one, leading to the assumption that the temporary conceptual storing system can only hold one item at a time. It essentially becomes a matter of priority, whether a stimulus is perceived as worthy for further processing, and hence consolidation in memory, or not.

The question of priority or worthiness for memory consolidation will require a judgment system. A good candidate to take on this task is ATTENTION, on which more details are explained in chapter 4.3, deciding which stimuli in a rapid succession most likely help to accomplish a given task.

3.2.2 Dynamic domain description

Unlike the static domains of individual pictures in naming tasks, an event description consists of dynamic domains that bear an extra burden on processing, because the designated speaker perceives what *happens* or *changes* on scene. The additional burden is explained by Habel and Tappe (1999:125), whose study on processes of segmentation and linearization in describing events suggests that experiencing a dynamic domain starts from a sequence of external stimuli, and only mental processes lead to the emergence of events. Events must therefore be constructed mentally, after individual pieces are recognized and conceptually prepared. Such an EVENT CONCEPTUALIZATION is the basic step in the construction of the content of an oral event description. A completed event conceptualization can then move forward to the process of lexical selection.

Another additional cognitive burden within the event conceptualization is the formation of an event structure, because this structure does not have to reflect the chronological order of the stimuli perception. Habel and Tappe (1999:127) point out, that such a "straightforward isomorphism between event structure and chronological ordering does not exist". What happens in a dynamic domain and is perceived as visual input "is often not temporally ordered in a strictly linear manner" (127). Even though we can rapidly generate conceptual representations of dynamic domains and, according to Coltheart (1999:257), are able to comprehend them almost instantaneously as we encounter them, there is significant, although unconscious, additional mental work to be done.

On the side, note that these instances of additional cognitive burden discussed above are not language specific. As Dietrich (1999:80) explains, the "march of ideas […] and the representation of the message are preverbal phenomena" and as such, despite the varying existing grammars and layouts of formulation, they are universal to all languages.

If we focus on sports commentary more closely as reference of dynamic domain descriptions, we notice that there might be several individual events occurring simultaneously. Whereas it is possible for a commentator to perceive and conceive developments and changes in parallel-motion events, it is impossible to verbalize them simultaneously, and narration in succession is complicated by the fact that these co-occurring events naturally neither possess a chronological nor hierarchical order.

In how far these decisions on chronology and hierarchy are controlled actions (aware to the speaker) or automatic actions (happening without the speaker's awareness), as well as the demand of working memory resources necessary for these decisions, will be discussed in more detail in section 3.4.1, where some solutions to verbalizing co-occurring events are presented.

3.3 Core processes from conceptual preparation to articulation

A summary of all core processes that play a role in the task of articulating a visual stimulus is presented by Levelt and Indefrey (2000:80). Figure 5 illustrates these processes and the sequence in which they are at work.

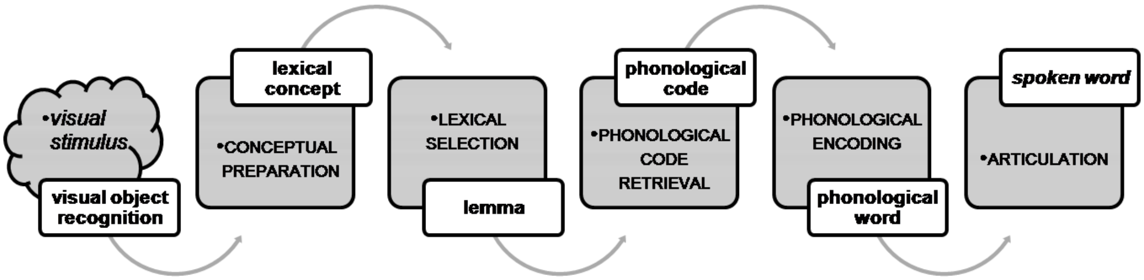


Figure 5 Processing stages in the generation of words (after Levelt and Indefrey 2000)
Core processes (grey) involved in the generation of words and their respective outcomes (white). Starting point is a non-verbal visual stimulus (cloud) and the final result a spoken word.

The term object recognition can be applied to both the first mental process as well as its outcome and represents the initiator of the pathway of processes in Levelt and Indefrey's model. Conceptual preparation can then transform the recognized object into a lexical concept which still has a very abstract form. Only after lexical selection takes place, will the initial stimulus become somewhat more concrete with the choice of a suitable lemma. However, it takes a few more transformations for a lemma to become an utterance: the retrieval of the respective phonological codes and the phonological encoding (later referred to as phonological production) create the phonological word that can be uttered by the use of various mechanisms in the motor cortex.

Lamb (1999:354) presents neurological evidence on the localization of these processes in the human brain. Magnetoencephalographies (MEGs) can produce images of the brain in which currently activated brain areas become visible. Thanks to this traceability the possibility to actually clock a process arises. As each above mentioned process seems to occur in a slightly different region of the brain, the evidence of process localization allows for good time estimates of the duration of each process from visual stimuli to spoken words.

The stimuli in Lamb's experiments were still pictures of animals and the task was to name the displayed animal orally. Figure 6 gives a visual account of the pathway of the processes explained in this section. The visualized MEGs of the subjects' brains suggest that visual signals perceived by the retina of the human eye would therefore first activate the VISUAL PERCEPTION (V) area in the occipital lobe of the brain. Despite its obvious importance in visual stimulus perception and reading tasks, however, the occipital lobe plays no known role in language production.

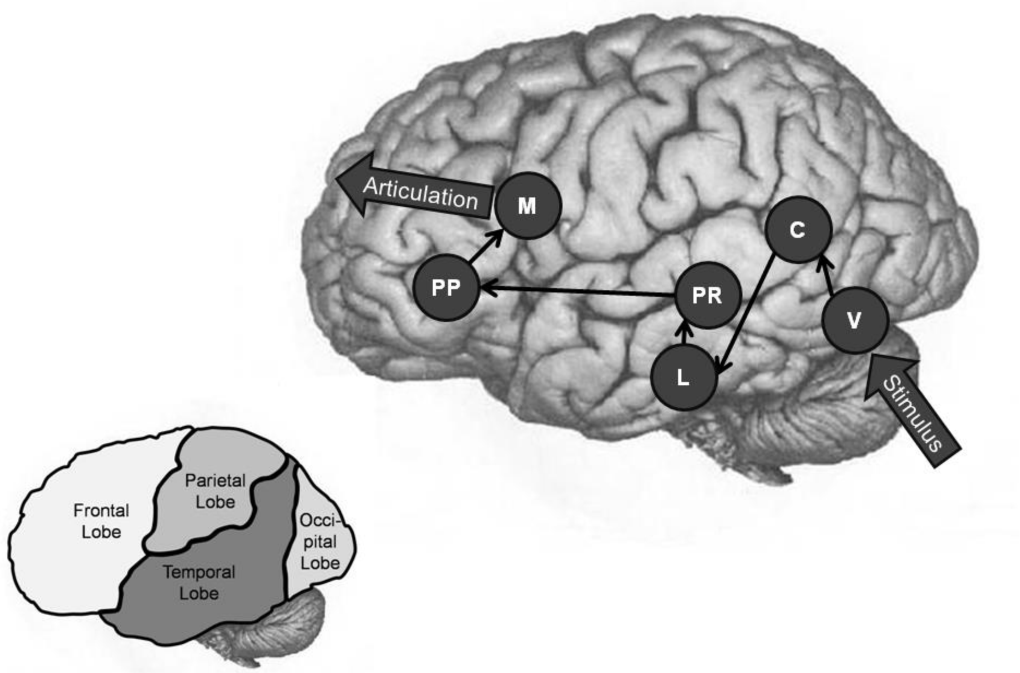


Figure 6 Localization of core processes from vision to articulation
Images created with overlays and inferences from Levelt & Indefrey (2000) and Lamb (1999).
Only cardinal nodes are indicated. Other active areas and sub-nodes irrelevant for the current purpose are left out. V= visual perception/ C= conceptual preparation/ L= lexical selection/ PR= phonological recognition/ PP= phonological production/ M= primary motor cortex

The visual area will then activate the region of CONCEPTUAL PREPARATION (C), located in the upper posterior temporal lobe. The activation of the conceptual system creates the attention required to further activate all other sub-systems (see section 3.4.2). A rough time estimate for the duration between visual object recognition and conceptual preparation is 150 msec, before the activation spreads to the lower temporal lobe where the LEXICAL SELECTION (L) takes place. The result of this process is the most suitable lemma for the articulation of the stimulus, and according to time course studies this process takes about 125 msec. Further on the pathway of the core processes towards articulation is the PHONOLOGICAL RECOGNITION (PR), where the phonological codes for the selected lemma are retrieved in the central temporal lobe, including Wernicke's area. PHONOLOGICAL PRODUCTION (PP), the actual encoding of the retrieved phonological codes, occurs in the frontal lobe. Both processes combined, code retrieval and phonological encoding, take another 125 msec to produce a phonological word ready to be articulated. Ultimately, activation spreads to the PRIMARY MOTOR CORTEX (M). From there, neurological 'commands' to the speech organs are sent, resulting in the ARTICULATION of a word. Phonetic preparation and the initiation of articulation are assumed to require roughly 200 msec.

Overall, the combined time estimates derived from the MEGs studied by Levelt and Indefrey suggest that it takes a speaker approximately 0.6 seconds to begin with the articulation of a target word given in a picture naming task. The comparatively constant speed (between 125 and 200 msec) at which each level proceeds is largely dependent on the nature of the processes. Dietrich (1999:57) characterizes the entire pathway of processes described in Figure 5 as transformative. Each process receives the input of the previous stage and transforms it into an output of a new form. Compared to an additive nature of a process sequence, where the previous form remains but "grows" with each process passed, the transformation allows not only for a more constant but generally higher pace.

3.4 The role of memory

Griffin's (2004) study on eye movements related to language production supports the assumption that memory plays an important role in dynamic domain description. She has researched speakers' gazing behavior in scene description during challenging speaking conditions. A gaze, compared to vision in general, is an intent fixed look at an object that presumably would render the storage of the target object in memory unnecessary, as long as this object is not removed. However, the findings in her experiments were insofar puzzling, as the subjects showed little interest in gazing at target objects while articulating them. Griffin discovered that speakers gazed at the target objects only for the duration that corresponds to the stages of lexical selection up to phonological encoding, suggesting that at some point (not necessarily only after these stages) the linguistically processed target object must have been stored in memory in some form. The fact that gazes do not occur during the entire process of verbalization, even while the possibility exists, strongly implies that everything that is to be processed mentally is stored in memory somehow – underlining Wolfe's quote in the beginning of this chapter, that vision itself remembers nothing.

Dietrich (1999:57) also points out that, besides the previously mentioned transformative nature of the processes, there are devices that can store a limited number of material for later recall and processing. These memory devices are an integral part of the solution to a high paced and fluent speech. When and where it is important for a speaker to keep certain information in store and why it is of advantage to have this material available unprocessed has been quickly touched upon above, but will be subject of a more detailed discussion in the following section on memory in dynamic domain description. In the subsequent section, examples of how perceived visual stimuli can spread the activation to linked information will demonstrate another instance of the role of memory within the task of verbalizing visual stimuli, before the last section on prototypicality will round off the chapter.

3.4.1 Memory in dynamic domain description

We have already mentioned the impossibility to simultaneously verbalize developments and changes in co-occurring events. However, a speaker has several options to solve this problem, which shows one specific instance of what role memory plays in speech production. Unfortunately, it is extremely difficult to illustrate the above suggested solutions with text samples from the data, because without the visual footage of the data set used in this research the reader could only speculate on the content of the ignored sub-events, for example.

Inspired by Habel and Tappe (1999:127) the following example sentences and the illustration in Figure 7 have been refined to show in an abstract manner that where no straightforward chronological order is given:

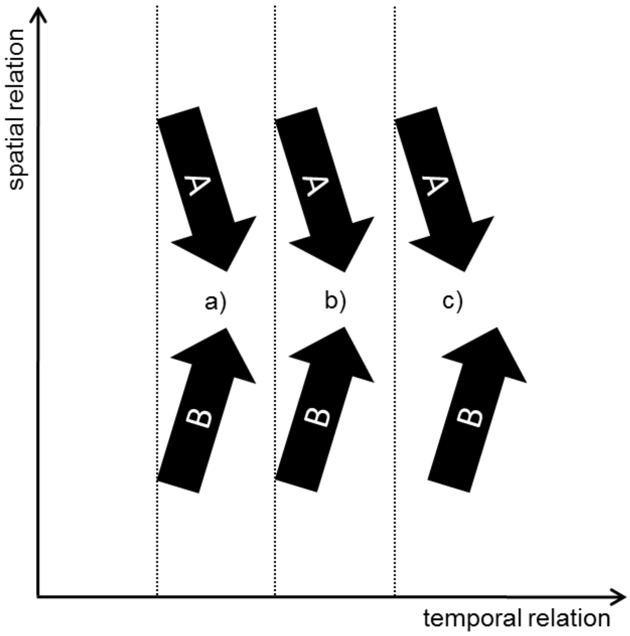


Figure 7 Verbalizing co-occurring events
Adopted and refined from Habel and Tappe (1999:128). A two-dimensional illustration with solutions a), b) and c) of verbalizing co-occurring events: spatial relation indicated vertically / temporal relation indicated horizontally.

a) simultaneous events can be described one after another:

"A is walking downwards and B is walking upwards".

This option presumably follows a first-in-first-out automaton of the perceived stimuli, and therefore is the solution that least relies on mental effort and the storage of material for later processing. One event will be perceived and also processed first, while the second event, if it is perceived almost simultaneously, is kept in a mental buffer until it enters the exact same processing as the first event.

b) some events can be declared sub-events and summarized to one main-event:

"A and B are walking towards each other".

The formation of a main-event is likely the most complex option, for which the possibility to store information about the co-occurring events is absolutely necessary. The subject will, identical to example a), perceive one event first but not immediately start processing it. Rather, the first event is kept largely unprocessed in a buffer while the second, co-occurring event, is perceived. Only in "retrospect" can a main-event be mentally constructed and the respective individual material processed accordingly.

c) some events can be declared mere sub-events that can be ignored in favor of others:

The situation described in c) shows a more detailed temporal sequence, where the initiation and the end of the movements do not share an equal point in time. Hypothetical verbalizations of this more complex situation could look like this:

"A starts walking towards B, now B starts walking towards A, A stops walking, now B stops walking".

or

"B stands still but A is walking downwards, now B moves upwards towards A, A stands still, and now B also stops walking".

Interestingly, Habel and Tappe (1999:127) point out that such "specific temporal relations between [entities] are usually neglected in verbalization". Therefore, even though c) is temporally more complex we should not expect to receive these additional details in a verbalization of the co-occurring events. The most typical solutions would resemble solutions a) and b), where the temporal relations are considered mere sub-events that can be ignored, as in:

"A is walking downwards and B is walking upwards".

or

"A and B are walking towards each other".

The decision in favor of these simpler solutions can have two different motivations. During the decision-making process one determining factor to declare some events as ignorable sub-events could be the lack of details perceived about them. Assuming, for example, that the speaker does not immediately realize the different point in time of the movement initiation due to the observation of the other events, he or she would likely omit the temporal relation altogether. A second factor could be a conscious judgment of irrelevancy to the communicational goal, which relies more on mental resources and temporal storage of information than the former.

In sports commentary, where we expect formulaic speech to ease exactly such situations of mental resource-demanding decisions as in scenario c), it is typical and often crucial to refer to spatial as well as temporal relations. It will be a challenge of the core analysis of this research to find formulaic speech that achieves this sort of detailed verbalization in a mental resource-saving manner.

3.4.2 Information activation from stimuli

In the discussion of the core processes from visual stimulus to articulation, Figure 6 illustrated the localization of each core process in a simplified way, in that only the areas with the highest activation found in MEGs were indicated – the so called CARDINAL NODES. It is important to interpret the illustration in Figure 6 as pathway of activation for a particular task, not as actual road a stimulus travels during its transformation, and to realize that for example in a task where auditory stimuli are presented for a verbalization, even though many identical core processes are involved, there would be a different pathway and graphical illustration.

A cardinal node can be thought of as a hub for nodes in the web of cognitive processes. According to Lamb's (1999) hypothesis of "nodal specificity and hierarchy", each indicated cardinal node with its specific function is hierarchically on top of a complex sub-web, shown in Figure 8. Let us zoom in on the neural network for vision:

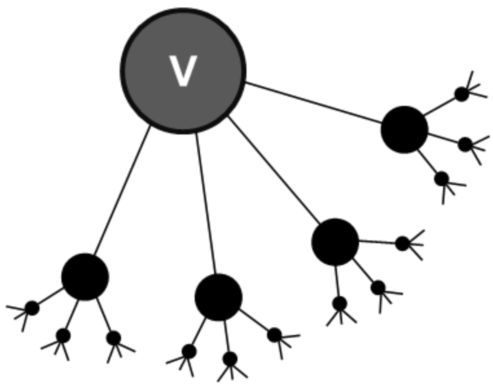


Figure 8 Cardinal node for vision and its sub-web
The cardinal node (v) for vision with its function as hub for the indicated sub-web.

The cardinal node (V), for vision, functions as hub for a number of hierarchically lower nodes. These sub-nodes on the other hand are on top of yet further sub-web structures, of which only three levels are represented here. Hence, each lower level node is its own cardinal node of a lower hierarchical web. According to Lamb (1999), each node at every level is believed to have a specific function.

A visual stimulus can trigger activation anywhere within the functional web of vision and spread the activation hierarchically bottom-to-top towards the cardinal node (V). From there, activation can spread top-to-bottom again to the other branches of the visual web or sub-web, as indicated in the activation route a) of Figure 9. Technically, depending on the activation strength of the main nodes of each sub-web, one activated node at the lower levels could spread its activation to the entire functional web. In example a), however, the dotted line illustrates only one additional activation of a sub-node within the functional web of vision.

Similarly, an activated cardinal node, e.g. (V), can spread the activation to a cardinal node of another functional web, in this example the cardinal node for the entire conceptual network, and from there further to others, as illustrated by the dash-dotted line on the activation path b) of Figure 9. This explains for example how a visually perceived stimulus can ultimately be articulated with the corresponding lemma for the lexical concept that was initially activated by the stimulus.

Even though the focus in this chapter lies on the pathway from visual perception to articulation, and activation spreads more or less in one direction from the visual network to the motor cortex (c.f. Figure 6), the activation paths of the entire functional web are in fact bi-directional and every node has the capability to spread activation hierarchically upwards towards to the cardinal node or downwards to the sub-webs.

The nature of any hierarchical structure dictates that there has to be a peak in the structure - a node that is on top of the entire hierarchy. Within the whole mental functional web the conceptual system takes on this role. Indicated with a black circle in Figure 9, the node (C) for concepts is the top node that is superior to all the cardinal nodes represented in Figure 6 and also of those that were not indicated for the purpose of the current research (e.g. the tactile functional web).

All cardinal nodes and their respective functional sub-webs within the neural network have a specific purpose and task to fulfill. These sub-webs, however, handle only one sensory modality. Everything in connection with visual perception, for example, is treated in the sub-web for vision (V), while the auditory modality is processed solely in the sub-web dedicated to hearing. The conceptual system (C) on the other hand, as main hub of the entire web, interconnects the information of multiple sensory modalities.

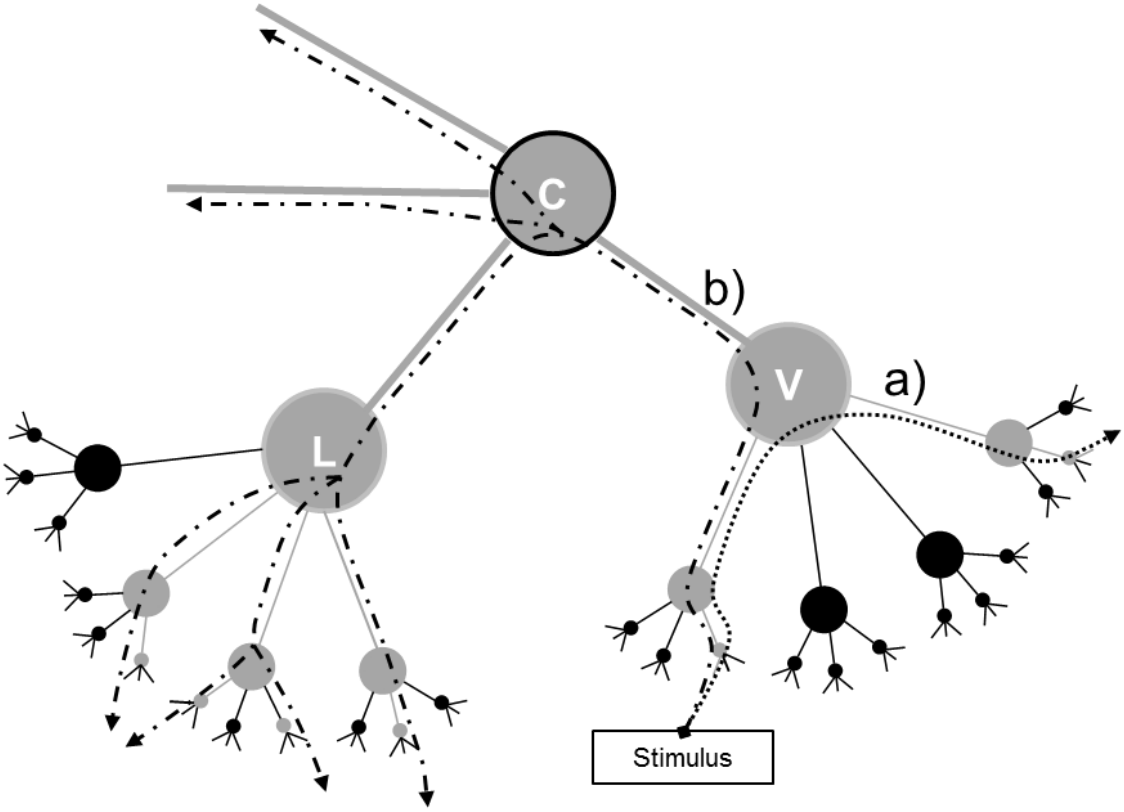


Figure 9 **Information activation from stimulus**

A visual stimulus activates from bottom to top higher level nodes within the same functional web (activated nodes in light grey). Once activation reaches the cardinal node of the visual web (v) it can spread a) to another sub-web of the same function and/or b) to the cardinal node of concept (c). Conversely, once the cardinal node (c) is activated, it may spread the activation hierarchically from top-to-bottom to other cardinal nodes and sub-webs of different functions, e.g. the lexis (l).

Lamb (1999:124) illustrates the above mentioned nodal specificity and hierarchy within the functional web with paradigm that covers exactly visual stimulus perception and integration, and also shows where the activation reaches the hierarchical peak at the level of the conceptual system: "[…] as long as we are going upward within the visual system we are going to higher visual levels; but as we continue upwards, we reach a point at which a high level visual unit, say the appearance of a cat, gets integrated with information from one or more other modalities, like the sound of a cat and the feel of a cat's fur or a cat's claws or teeth. At such a point we are in conceptual structure".

While the activation of the conceptual cardinal node (C) is a requirement for the integration of all stored information on an entity, two different sources of activation exist. As we have observed so far and illustrated with Lamb's example of the cat, any functional sub-web can spread its activation hierarchically upwards until it reaches the conceptual structure. Cowan (1999:64) calls this the *external source* of directing information toward conceptual processing and into the FOCUS OF ATTENTION (e.g. the visual stimulus). The human mind, however, also has mechanisms that allow an individual to directly activate the conceptual structure without external stimulus activation - from own motivation so to speak. Imagine you just booked a two week vacation on an island and then would want to picture the perfect sandy beaches there. Without any difficulty, and without ever having been there, it is possible to visualize those beaches in all kinds of details. This so-called *internal source* of activation roots in what Cowan termed the CENTRAL EXECUTIVE, which is explained in more detail in section 4.2.2 on Cowan's embedded-processes model.

3.4.3 Prototypicality

Within the context of information activation it is useful to introduce the idea of prototypicality at this point. How is prototypicality linked to the role of memory? Every stimulus contains several properties that can trigger the activation of a corresponding sub-node at a lower level. Field (2005: 55) illustrates a network of properties that are linked to the concept *plane.*

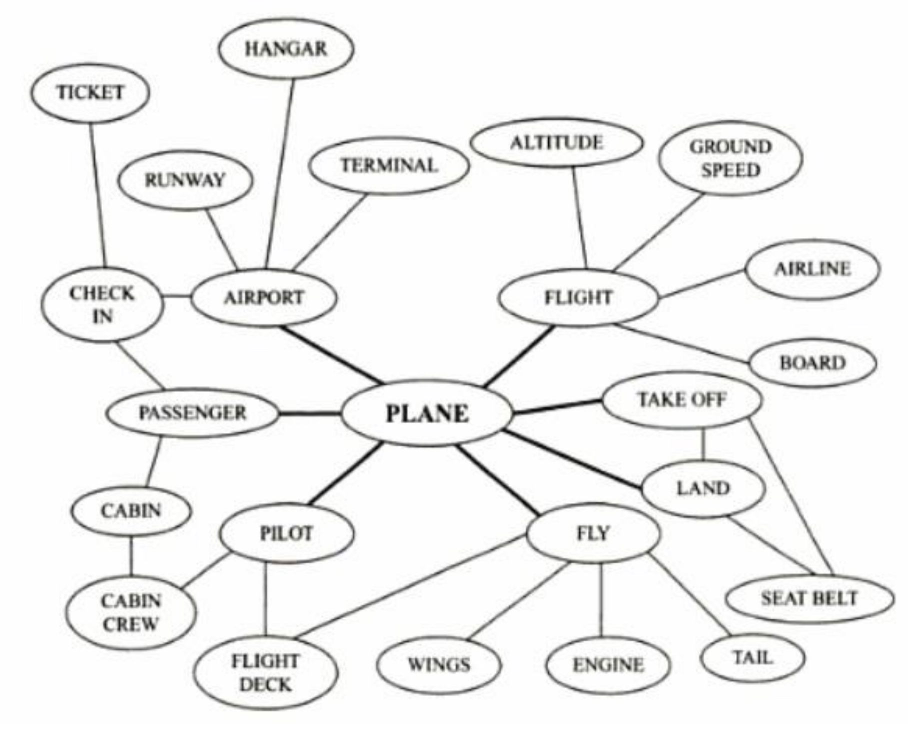


Figure 10 Information activation from stimulus (Field 2005)
Reproduced with permission from Taylor & Francis Books (UK): Field, J. (2005). Language and the Mind New York, NY: Routledge.

The concept of a plane is linked to a variety of other concepts. Lamb (1999:208) argues, however, that the functional web is built in a way that the more prototypical characteristics have stronger and faster connections to the upper-level nodes than less prototypical characteristics. If we take a bird as a visual stimulus for a very simplified example, the bird has several characteristics (e.g. it has a beak, feathers, two wings, two legs, it flies, etc.) but some of them (i.e. wings, flying) will likely count as more prototypical than others. As a consequence, when the human eye perceives the stimuli of wing shapes or a flying movement in an object, the corresponding concept *bird* is more likely and faster activated than with less prototypical characteristics.

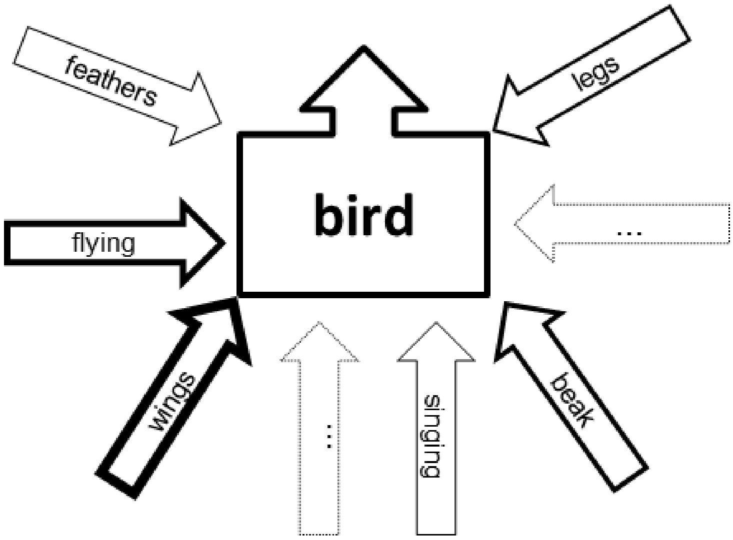


Figure 11 Prototypicality (after Lamb 1999)
More prototypical characteristics associated with *bird* have stronger connections (thicker outlines).

Prototypical features find their way into activated memory and/or the focus of attention quicker than non-prototypical features, and require less attention direction from the central executive. Therefore, two observations on prototypicality lead to two important conclusions for the current research:

One, nodes for prototypical characteristics have faster and stronger connections to upper-level nodes, which in vision-to-word transformation allow for speedier information processing and quicker and more efficient information integration, especially in high-pressured situations. This argument strongly links prototypicality to routine context where recurring events can be conceptualized quicker than novel events.

Two, prototypicality is a human construct, not inherent in an object itself, is culturally defined and must, or rather can, be learned. This means, that stronger and faster activation paths between sub-nodes and upper-level nodes of a functional web, and even between different functional webs, are developed over time. The assumption here is that this learnability of these more efficient pathways therefore also allows a speaker to build and train them for a specific intended purpose, similar to the recognition of prototypical visual characteristics. This is one explanation for the possibility of acquiring and efficiently applying field-specific formulaic speech.

3.5 Summary

Sports commentary as a verbalization of non-verbal dynamic domains uses a highly resource-demanding and complex form of input, due to the additional steps needed to process non-verbal material in general, and the event-formation task that is required in dynamic scene description specifically.

Since vision itself exists only in the present and remembers nothing, everything that is processed further must at least temporarily be stored somehow. In addition, the hypothetical solutions to the dilemma of verbalizing co-occurring events have shown that memory mechanisms, so-called BUFFERS, play a role in keeping certain information in an unprocessed state for later use.

The human brain is a large neural network and operates by means of neural activation. The entire linguistic system, as part of it, therefore also functions the same way. All linguistic processes can be seen as interconnected functional webs in a hierarchy headed by the conceptual system, which can integrate multi-modal information.

One stimulus perceived in the visual area based in the occipital lobe of the brain, for example, can spread neural activation hierarchically upward to the conceptual system, and from there further to other functional webs, such as the motor cortex in the frontal lobe. There is no actual physical matter travelling between these webs – all processes on the pathway from vision to word are transformations of the neural activation settings; i.e., the neural activation setting representing a phonetic code for a lemma activates the setting for the respective phonetic production.

Some connections within and between functional webs are faster and stronger than others. The case of prototypicality as a human construct, not inherent in an entity itself, suggests that such connections are not only more efficient and therefore useful in high-pressure situations, but also learnable and trainable for specific purposes.

4 WORKING MEMORY OVERLOAD

"… one can be overwhelmed by new information – to the point that it seems to be too much to comprehend, too confusing or complex to file away in memory".
Cowan (2005: 1)

4.1 Introduction

In this chapter the focus will center around two main concepts that are relevant for the discussion of working memory overload. First, the term WORKING MEMORY itself will have to be defined as to its specific use in the current paper. There are many influences from different fields of research (neurology, psychology, linguistics, computational science, just to name a few) which produced a vast collection of memory models that sometimes have set a very specific and field motivated focus on the subject matter and, at other times, appear to contradict each other in the most fundamental conceptualization and terminology. Second, in order to establish the rationale for a potential working memory overload, the working memory's nature and CAPACITY LIMITS must be investigated. Similar to the concept of working memory there is not one clear-defined capacity limit, as we have for example on technical storage devices, but rather a range of different measurements and interpretations. During the process of collecting evidence for a potential working memory overload in dual tasks, attention will be specifically turned to the implications for language production.

4.2 Defining working memory: two sample models

It is tempting to define a term against any given counterpart and perhaps most tempting to compare working memory to long-term memory. The concept of WORKING MEMORY is a newer and refined notion that covers some aspects of the somewhat traditional term SHORT-TERM MEMORY that has commonly been used as counterpart of long-term memory. However, working memory is functionally much more than a replacement terminology.

It is misleading to allocate certain features in an "either/or fashion" to either working memory or long-term memory. As we will see later in the discussion of two popular groundwork memory models, we should avoid considering working memory as an isolated unit from long-term memory. But, if working memory is not simply everything long-term memory does not cover – how do we start?

Akira Miyake and Priti Shah (1999a) offer an interesting and detailed collection of different memory models and working memory definitions. An important distinction made by Miyake and Shah is the two-fold analysis of the functional perspective in contrast to the content-oriented perspective. And in fact, whereas some models excel in explaining working memory's functional features, others appear convincing in the way they frame out the actual content held in working memory. The following comparison between two seemingly contradicting models is expected to give not only an interesting view of the different approaches, but to show areas of consensus that help in the establishment of a language-oriented memory model.

4.2.1 Alan Baddeley's multi-component model

Baddeley and Logie (1999:31) postulate a multi-component model in which working memory is primarily concerned with storing visuospatial and phonologically-based material and maintaining this material in an activated state.

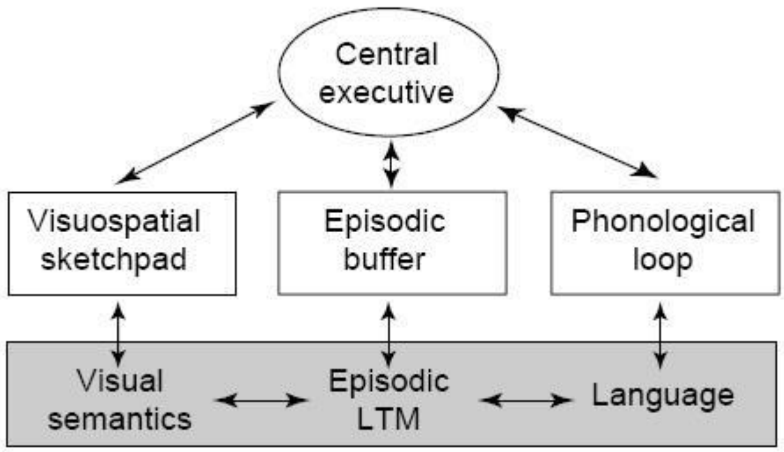


Figure 12 Multi-Component Model (Baddeley 2000)

Shaded areas represent *crystallized* cognitive systems capable of accumulating long-term knowledge (e.g. semantic knowledge), while unshaded areas represent *fluid* capacities (such as attention and temporary storage). Reproduced with permission from Elsevier: Baddeley, A.D. (2000). The episodic buffer: A new component of working memory? Trends in Cognitive Science, 4(11), 417-423.

Their model derives from studies of brain-damaged patients, which enabled them not only to elaborate functions of the individual components, but also to biologically implement their model. The areas in the human brain responsible for most of the working memory activities were found to be located in the left parietal lobe (for verbal short-term memory), the right posterior parietal lobe (for much of the visuospatial working memory) and the frontal lobe (for some of the executive functions).

A key claim by Baddeley and Logie (1999:31) is that "working memory and long-term memory comprise two functionally [not structurally] separable cognitive systems". The name of the model hence does not reflect a separation of working memory from long-term memory, but derives from the three components within working memory itself with the following corresponding functions: While the PHONOLOGICAL LOOP stores and processes verbal and acoustic materials the VISUOSPATIAL SKETCHPAD executes the same storage and processing function for visual and spatial information. The model's third element of the working memory, the EPISODIC BUFFER, was elaborated on by Baddeley (2000) and is assumed to be capable of storing information in a multi-dimensional code. It thus provides a temporary interface between the "fluid" capacities (phonological loop and the visuospatial sketchpad) and the "crystallized" capacities of long-term memory.

Both the phonological loop and the visuospatial sketchpad are divided into two subcomponents (not displayed in Figure 12): a passive storage component and an active rehearsal component that refresh the stored information and prevent it from decay.

The CENTRAL EXECUTIVE is responsible for the coordination and control of the three main components of working memory. According to Baddeley and Logie (1999:40), some proposed functions of the central executive include "the capacity to focus attention, to switch attention, and to activate representations within [long-term memory]". A promising additional (although not firmly established) function is introduced by Baddeley (2007:138), namely the capacity to divide attention, which helps to explain dual task phenomena to a certain extent.

Despite the many elaborations and refinements over the last decade, Baddeley and Logie's central executive essentially remains an attention-based control system with no own storage capacity. Even in their own words, the authors admit that the lack of specification of the central executive provided by the model is a "source of frustration" (1999:40), but they want to leave the question of how the central executive is governed in more detail open for further empirical research and center their main arguments around the three components of the multi-component model that they have so far observed.

Summary of the key components of Baddeley and Logie's multi-component working memory model:

4.2.2 Nelson Cowan's embedded-processes model

A different approach towards working memory is taken by Nelson Cowan (1988, 1999). He sees working memory not as a functionally separate cognitive system but as an integrated unit within long-term memory. According to the embedded-processes model, working memory is the part of long-term memory that is currently activated.

Any material in long-term memory can receive a heightened activation caused either by external stimuli that in the fashion of a chain reaction can activate subsequent material, or by the CENTRAL EXECUTIVE that, identical to Baddeley's (2000, 2003) version of the multi-component model, directs attention and control over the memory components and the stored material. Cowan (1988) first structured his embedded-processes model into the following three main components: LONG-TERM MEMORY has no known capacity limits, whereas ACTIVATED MEMORY is the time-limited part of long-term memory that has been pre-activated for working memory purposes through priming mechanisms. The FOCUS OF ATTENTION however, has a fixed capacity limit but can hold pointers to the activated memory.

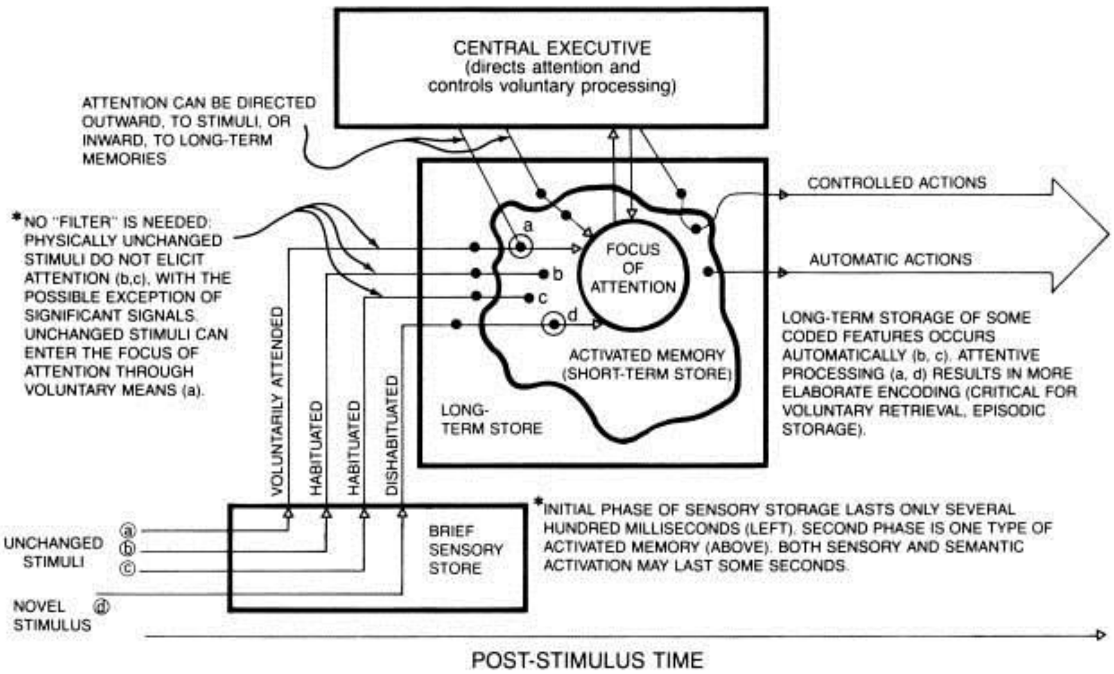


Figure 13 Embedded-Processes Model (Cowan 1988, 1999)

Reproduced with permission from APA: Cowan, N. (1988). Evolving conceptions of memory storage, selective attention, and their mutual constraints within the human information-processing system. Psychological Bulletin, 104(2), 163-191.

As seen in Figure 13 and mirrored by the name of Cowan's model, the organization of the three main components is embedded. Activated memory and the focus of attention build the working memory, with activated memory being a subset of long-term memory, and the focus of attention being a subset of activated memory.

The embedded-processes model also comprises a central executive that Cowan (1999:67) defines as "the set of processes influenced by instructions or incentives". Operationally it can activate stored information within long-term memory as well as set the attentional focus on specific activated information. The central executive therefore also serves as an interface between the three main components in Cowan's model.

Summary of the key components of Cowan's embedded-processes working memory model:

CENTRAL EXECUTIVE	**LONG-TERM MEMORY**	**ACTIVATED MEMORY**	**FOCUS OF ATTENTION**

4.2.3 Discussion

Even though the two chosen working memory models appear contradicting in their designed structure and implementation with long-term memory they share many features – also with some of the other eight models presented and reviewed by Miyake and Shah (1999a). To find the largest possible area of consensus is key for the present research, especially in the later process of developing a language-based memory model in order to analyze the linguistic data.

Both models presented above in more detail point out that working memory is not to be seen as an isolated unit for short-term storage. Miyake and Shah (1999b: 443) see an agreement that working memory is not really about "memory" per se, but as much about control and regulation of our cognitive action. This observation is important in the understanding of the notion WORKING MEMORY that over the last decades has evolved out of the insufficient and somewhat unsatisfactory term SHORT-TERM MEMORY, which at least in the early stages of memory modeling was seen as what Miyake and Shah call the "separate box" or special place in the mind or the brain. In fact, no single model in their collection and discussion looks at working memory from such a structural point of view. All are concerned with a content-oriented approach and/or a functional perspective and agree that different brain areas together are responsible for the working memory phenomena that we can witness.

In the quest of defining working memory the current research does not claim to present the philosopher's stone. Rather, it will present four areas of theoretical consensus found in Miyake and Shah's (1999a) extensive collection that help in the establishment of a more language-tailored working memory (WM) model:

1. *WM is a set of mental processes or mechanisms*	*2.* *WM is used to control, regulate and maintain information for complex cognitive tasks*	*3.* *WM is capacity-limited*	*4.* *WM and long-term memory share a close relationship*

The first point of consensus defines working memory from a neurological perspective. Working memory does not have the character of a single unit in a fixed place in the brain or mind. It relies on different subsystems in the cognitive architecture of the human brain and hence there are also multiple representational codes at work respectively. This interweavement with other cognitive subsystems complicates the work of pointing out the actual content in working memory, as each subsystem requires thorough knowledge of the respective mode of coding information.

Point two in the theoretical consensus supports the approach of analyzing memory phenomena against the background of spontaneous under pressure speech, such as sports commentary. Generally, the task-relevant information that is to be maintained, regulated and controlled in a complex cognitive task can be of novel or familiar nature. With respect to the second hypothesis stated in section 1.4, the question in the current research about the degree to which, in the specific case of live coverage of a sporting event, the visual stimuli a commentator receives are novel or familiar. It can be argued that each stimulus carries a sense of novelty, because no situation in a sporting event can ever have been exactly played the same way before. On the other hand, especially those familiar with playing or watching sports games know that despite the imaginably infinite outcomes of every single action, the realistic options are usually very limited and hence at least partly foreseeable. This routine context will take away much of the stimulus novelty to an experienced sports commentator.

Already in the introduction it was mentioned that working memory is capacity-limited. While it is rather straightforward to detect a working memory overload in a dual task for example, due to observable failure of the subject, it is impossible to give a general limitation measurement. The difficulty in this third point of the theoretical consensus lies in the fact that there is no all-encompassing scale unit for memory capacity in the human mind. The capacity limitation as such emerges from the limitations of the individual processes that combined constitute working memory.

Fourth and final, both memory models presented above, as well as the other theories discussed in Miyake and Shah (1999a) agree that most of the working memory contents are activated long-term memory representations. By means of activation cues these contents can initiate the activation of long-term memory representations that are not yet activated but identified as closely linked to already activated material.

4.3 Theoretical consensus across working memory studies

Studying a variety of working memory models is often confusing because it is complicated by the partly idiosyncratic terminology that is at use. While some authors (e.g. Cowan, Lovett et al., O'Reilly et al.) for example mostly describe the explored working memory phenomena as PROCESSES, other theories (e.g. Engle et al., Baddeley and Logie) center their arguments around the terms COMPONENTS or SYSTEM, which to the reader wrongfully suggests a more intrinsic dynamic and embeddedness for the former terminology. It is therefore no surprise that much more theoretical and functional consensus can be found after a careful comparison than what appears at first sight. Baddeley (2007:117) admits in his latest work, that he and Cowan are fundamentally in broad agreement, and only differ in emphasis: Whereas Baddeley himself stresses short-term storage in his model Cowan focuses more on the attention-controlling components.

The following three sections attempt to shed light on the existing theoretical consensus across a number of working memory models and studies. Much of the material in chapter 4.3 is based on the discussion by Kintsch et al. (1999) who scrutinize the ten models in Miyake and Shah's collection with a "test" consisting of eight general pre-formulated questions. In a section of its own, Miyake and Shah (1999b) themselves evaluate the contributions of their selected working memory models with respect to emerging general consensus, unresolved theoretical issues, and future research directions.

4.3.1 Basic mechanisms and representations of working memory

All contributors of the working memory models compared agree that working memory is not structurally different from other memory mechanisms, that is, working memory phenomena cannot be located in a special place in the brain, which the older concept of short-term memory mainly assumed (Miyake and Shah, 1999b:443). The editors therefore warn that expressions such as "to be in working memory" still trigger the misconception that information literally has to be transferred into working memory. On the contrary, however, Miyake and Shah (1999b:445) point out that some researchers have even claimed that working memory might not exist at all, due to the obsolescence of the traditional view of working memory (or rather short-term memory) as a separate place in mind.

Although neuro-imaging studies try to highlight where certain specific working memory processes take place in the brain, as we have seen in chapter 3.3, they should not be interpreted as attempts to localize working memory in its entirety. There is wide-spread agreement that several brain areas cooperate (partly simultaneously) to produce working memory phenomena.

In reference to ENCODING information for working memory, Kintsch et al. (1999:413) conclude that only few models really tackle the subject. A common view, most explicitly explained by Cowan's embedded-processes model, is that "encoding of information in working memory consists of activating the composite of appropriate features in long-term memory". This is in accord with the above mentioned claim that working memory is not structurally different from long-term memory, rather, it is serving a different function – the information itself is not differently encoded in working memory. Baddeley (2007) also accepts this view, clarifying once more that his multiple-component differs from Cowan's approach mostly from a functional perspective. Here we can observe a partial merging of the two positions, which in Miyake and Shah (1999a) were perceived as not fully compatible with each other.

Another point of consensus with respect to encoding can be seen in Ericsson and Delaney's (1999) argument that in expert performance information processing is faster due to the possibility of constructing a more robust structure for information retrieval already during the initial stages of processing an incoming stimulus. This point, not disputed by the other authors, suggests that an expert performer could process and store even new incoming stimuli and information in long-term memory in the same way as prototypical features of stimuli, with stronger and more efficient retrieval connections.

The MAINTENANCE of information in working memory is, at least theoretically, dealt with by most models presented. Many authors, e.g. Cowan (1999), Baddeley and Logie (1999), Kieras et al. (1999), presuppose a natural decay of information in working memory. Once in an activated state for working memory tasks, the accessibility time span for working memory content is limited due to a number of factors (see chapter 4.4 for more details).

In order to keep material activated in working memory, there are rehearsal mechanisms at work. Verbal rehearsal is the most discussed mechanism in Miyake and Shah's (1999a) collection, but surprisingly not dealt with in detail by any of the contributors. Only few authors suggest other means for maintenance besides verbal rehearsal. Baddeley and Logie (1999) include a specialized sub-component both in the phonological loop and the visuospatial sketchpad for active rehearsal and decay prevention of information. A different approach on maintenance is taken by Cowan (1999), where the activation time of working memory content is dependent on its initial strength of activity, not special purpose components of the working memory model. Material in the focus of attention (the highest activity level in the embedded-processes model), for example, will remain available in working memory for a longer duration than simply activated long-term memory material. However, also Cowan's suggestion relies on a component, although not an exclusively specialized one for maintenance: The central executive plays an important role in re-activating and maintaining working memory material for the use in complex cognitive tasks.

As for the RETRIEVAL of working memory material, Kintsch et al. (1999:414) state that there is a "common assumption that information 'in' working memory is directly and effortlessly retrievable", which for many models is the conceptional foundation of working memory. Similar to maintenance, a higher initial activation into the focus of attention is assumed to guarantee also a more accurate and faster retrieval. Ericsson and Delaney (1999) further suggest that retrieval from long-term memory requires available retrieval cues, whereas retrieval from activated material in working memory itself is believed to function without them. This is in accordance with the authors' earlier point of the possibility to already encode some information for long-term memory with stronger and more efficient retrieval connections.

A fourth point is concerned with the actual REPRESENTATIONS of the coded information. The former three points of theoretical consensus (encoding, maintenance and retrieval) are clearly viewed from a functional perspective, focusing on the processes, mechanisms and functions that subserve cognitive activities. The question about the actual representations on the other hand tackles working memory from a content-oriented perspective and looks at what "material" is within working memory, that is, what actually constitutes working memory.

This content-oriented challenge is a source of controversy, closely tied to the discussion on whether working memory is unitary or non-unitary in its nature. Different sub-systems are believed to operate on specialized codes. Sydney Lamb (2009) also supports this point from a neuro-cognitive perspective, pointing out that, although on the local levels there is uniformity of cortical structure and function, primary areas, such as the primary visual or primary auditory areas, are known to have specialized structures of their own. According to Kintsch et al. (1999:414) "there is limited support for a completely unitary view of working memory", but also differences as to the degree to which working memory is non-unitary.

Most contributors of Miyake and Shah's (1999a) working memory model collection therefore postulate domain-specific codes to different extents. To illustrate this divergence we once again turn to the two working memory models presented in more detail in chapter 4.2. The embedded-processes model, for example, accepts the idea of domain-specific codes in working memory, which otherwise seems more applicable for an integration into a model with separable sub-systems, but Cowan highlights the similar properties of the different types of coding. In the multiple-component on the other hand, Baddeley supposes different codes even within the same components. The majority of the other models presented in Miyake and Shah (1999a) can be placed somewhere along the two lines of Baddeley or Cowan.

Kintsch et al. (1999:415) point out that "domain-specific representations are supported by different regions [in the brain that are] specialized for various perceptuomotor and cognitive processes" and could be the basis of functional specialization. When they further suggest that experimental evidence by earlier researchers have long supported the existence of different representations for temporal and spatial coding, it becomes clear that the theoretical divergence on this point derives most likely from the fact that despite the attempt of crossing the boarders of a purely functional perspective, the existing models cannot yet satisfyingly deal with the content-oriented perspective.

4.3.2 Control and regulation of working memory

In the words of Miyake and Shah (1999b:446), "working memory is not really about 'memory' per se; it is also about 'control' and 'regulation' of our cognitive action", such as problem solving, language processing, decision making, etc. However, at this point, no model in the literature can satisfactorily show what then exactly governs this 'controller' and 'regulator', resulting in a somewhat unresolved "homunculus" problem. In that respect, most working memory models in the collection can therefore be characterized as function-oriented, in the sense that they specify the tasks and necessity of a regulatory mechanism, and stop short of explaining the activator or motivation of the component itself.

Kintsch et al. (1999:417) ask why we have such a strong need to include control mechanisms and whether we could get control and regulation in working memory without explicit executive control. The need for something that controls and regulates working memory automatically implies that such a mechanism would be on top of the working memory hierarchy. As we have seen in the discussion of Cowan's embedded-processes model and Baddeley and Logie's multiple-component model of working memory, both designs include a so-called CENTRAL EXECUTIVE that controls and regulates working memory.

Some models try to specify certain sub-functions of the central executive. Kieras et al. (1999) and Ericsson and Delaney (1999) stress the role of the central executive in creating strategies for enhanced processing and encoding of information. They believe that such strategies allow for more skilled retrieval and successful application of the processed information in complex tasks.

Cowan (1999:64), on the other hand, highlights that the attentional focus of his model is directly influenced by the central executive, which can direct attention outward to a stimulus or inward to memories in long-term memory. If the central executive directs attention towards a perceived stimulus, the representation for that stimulus will receive the highest possible activation within the working memory system, resulting in a more elaborate form of encoding critical for later voluntary retrieval. Therefore, the central executive is also assumed to control our voluntary processing of information – those processes that do not directly result in automatic actions.

Baddeley (2007) explores the central executive with neuro-imaging and experimental setups, suggesting that the central executive depends largely, but not exclusively, on the frontal lobes of the brain. He further proposes multiple functions that cover the following executive processes:

- to focus attention
- to switch attention
- to divide attention

Many experiments testing the above mentioned three executive processes were carried out with patients suffering some sort of brain damage in the frontal lobes to cross-test and support his hypothesis. This large area of the brain however, is also responsible for other processes, not exclusive of the central executive, and therefore, it can be inferred that the central executive is not a unitary construct or a structurally separate entity within working memory.

4.3.3 The role of working memory in complex cognitive tasks

According to Kintsch et al. (1999:426) complex cognitive tasks "can be characterized as being under cognitive control, involving multiple steps of processing, involving multiple components of the memory system, and requiring fast access to large amounts of information". These four characteristics shall be discussed in more detail and linked to points of consensus in working memory studies.

The previous section already pointed out that some sub-systems of working memory serve functions despite the immediate accessibility of information for everyday mental activities. Taking the data of the current research into account, some working memory functions will be explained in this section with direct references to sports commentary, albeit the consensual arguments presented are believed to be valid for most complex cognitive tasks.

It is almost superfluous to mention that sports commentary, transforming visual stimuli into suitable verbal representations, is a conscious task, and as such heavily relying on CONTROLLED PROCESSES. Although it is ultimately the goal of the current research to point out more or less automated long-term memory solutions in sports commentary, it should be understood that these solutions exist mainly due to the working memory overload primarily caused by the permanent control and coordination of the involved processes, and as such percentally constitute only a small but key contribution to the overall commentary.

Controlled processing is covered by most models in the component of the central executive, comprehensibly portrayed by Cowan's embedded-processes model in Figure 13. If a stimulus is voluntarily attended to by "command" of the central executive, it will hierarchically rise from activated memory into the focus of attention, which will eventually result in controlled actions. Furthermore, the central executive is equally important in dealing with novel input, to which it can direct attention in order to encode it more elaborately for long-term storage and further processing within the focus of attention.

As chapter 3 has shown, vision-to-word transformation uses a number of mental processes: visual perception, conceptual preparation, lexical selection, phonological recognition, phonological production, articulation. It can therefore also be argued that sports commentary must rely on some form of COORDINATION OF MULTIPLE PROCESSING STEPS, in order to successfully cover the visual action. In the context of Figure 6, it was mentioned that obviously different pathways exist for different tasks. All transformative processes described are goal-oriented, and thus, there has to be a component within working memory responsible for this coordination. From the models in Miyake and Shah's collection, we cannot tell exactly how and where this happens, but again, the central executive is a good candidate. Since it is responsible for controlled processing and directed attention, it is assumed to also "work the switches" for the pathways from vision to word and others.

A further characteristic of complex cognitive tasks is identified by Kintsch et al. (1999) as those requiring MULTIPLE COMPONENTS OF WORKING MEMORY. Sports commentary fulfills this in the sense that its vision-to-word transformation requires all mentioned components, presented in chapter 4.2 (both in Cowan's embedded-processes model and Baddeley and Logie's multiple-component model). The following two tables summarize what each component covers with respect to sports commentary.

In terms of Cowan's approach, sports commentary relies on all specified components with the functions presented in Table 2.

Component	*Function (in context of vision-to-word)*
LONG-TERM STORAGE;	e.g. background knowledge, technical terms, participants' names, field-specific terminology, etc.
ACTIVATED MEMORY;	for a goal-oriented instant accessibility of the above mentioned information retrieved from long-term memory for a given situation.
FOCUS OF ATTENTION;	for the visual stimuli that are novel or voluntarily attended to.
CENTRAL EXECUTIVE;	to direct attention outward to stimuli or inward to long-term memory and activated memory.

Table 2 Embedded-processes model (Cowan): components and functions
Components and functions of the embedded-processes model (Cowan, 1999) in context of vision-to-word transformation of stimuli in general, and sports commentary in particular.

The same argument can be made for Baddeley and Logie's working memory model. Details for each component are listed in Table 3.

Kintsch et al. (1999:425) assume that "many skilled everyday activities require the maintenance and later retrieval of a large amount of information usually considered beyond the capacity of working memory". They avoid limiting working memory capacity to a certain number or amount of information, but rather look for a theoretical consensus on how working memory capacity can be augmented during such activities.

One idea has asserted itself out of Miyake and Shah's working memory model collection as possible explanation to deal with tasks that involve a LARGE AMOUNT OF INFORMATION THAT EXCEEDS TYPICAL WORKING MEMORY LIMITATIONS. It is long-term memory, although not in the strict sense of the two models presented in chapter 4.2. Ericsson and Delaney (1999:291) for example postulate that the traditional separation of memory, knowledge and processes does not meaningfully hold up. Their "long-term working memory" approach blurs these borders and gives long-term memory a much larger role in complex cognitive tasks than just the storage function of declarative knowledge. Young and Lewis (1999), as well as O'Reilly et al. (1999) embrace this idea, and others, while not elaborating along these lines, at least do not dismiss it.

Component	*Function (in context of vision-to-word)*
VISUOSPATIAL SKETCHPAD;	to temporarily store and process the perceived visual stimuli.
PHONOLOGICAL LOOP;	to process and prepare the verbal material for output.
EPISODIC BUFFER;	as interface between attention, temporary storage and long-term memory, keeping information in multi-dimensional codes.
CENTRAL EXECUTIVE;	to focus or switch attention, activate long-term memory representations and coordinate the above mentioned three sub-components.

Table 3 Multi-component model (Baddeley and Logie): components and functions
Components and functions of the multiple-component model (Baddeley and Logie, 1999) in context of vision-to-word transformation of stimuli in general, and sports commentary in particular.

4.4 Capacity limitations of working memory

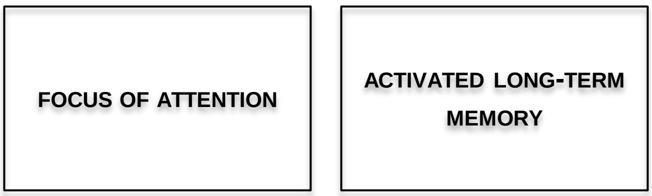
As pointed out earlier, a variety of factors complicate the task of measuring the capacity of working memory. The existing measuring methods vary not only in their technique, but also in the specific content that is measured. This section attempts to clarify the capacity limitations of working memory by means of memory capacity studies from different branches of linguistics to develop the implications of capacity limitations relevant for the current research.

4.4.1 Different capacities for different aspects of working memory

Cowan (2005:1) describes working memory capacity as "the amount that an individual can hold in mind at one time". His definition is of course based on the embedded-processes model of working memory and therefore a closer look at its components is necessary to understand what "amount" is meant exactly.

Many authors (e.g. Lovett et al., Engle et al., Ericsson and Delaney) agree with Cowan that working memory is two-fold in that it must not only hold information of long-term memory on a higher activation level (content-oriented) but also contain processes that can achieve and maintain this higher activation level via controlled attention (function-oriented). In terms of the embedded-processes model these two parts constituting working memory can be identified as ACTIVATED LONG-TERM MEMORY for the content-oriented component on the one hand the FOCUS OF ATTENTION for the function-oriented mechanism of working memory.

Due to this division of working memory it can be assumed that there is both a capacity limitation of the number of activation processes (function-oriented) as well as a limit to the information held active for current processing (content-oriented). It follows that there cannot be a single all-encompassing working memory capacity limit and that the combination of the individual limits together constitutes the real capacity limitation of working memory. As a consequence the question of working memory capacity is best addressed by looking at the capacities of the two individual components that working memory comprises:



4.4.2 Capacity limits of the focus of attention

Material in the focus of attention is the highest activated within the memory system. Its heightened activation is necessary for the immediate use to successfully master a complex cognitive task. According to Baddeley (2007:117) the central executive guides the focus of attention and is responsible for four executive processes.

First and foremost the central executive is capable of *directing attention* to certain material already in activated long-term memory – lifting it hierarchically into the higher activated focus of attention. There is a distinction made between directing attention voluntarily to a familiar stimulus that is perceived, as opposed to attention that is directed because it is elicited by a novel stimulus, for example. However, in either situation, perceived stimuli that are directed into the focus of attention by central executive processes will most likely result in controlled actions as output (Cowan 1999:64).

The second executive process is to *divide attention* between concurrently activated material in working memory and is closely linked, if not identical, to the third process of *switching attention*. That there is no clear-cut boundary between these two processes is supported by Klingberg (2009:78) whose observations from a simultaneous task experiment suggest that attention-switching in the overlap areas is more likely than an attention-dividing. Nevertheless, the second and third executive processes postulated by Baddeley (2007:117) most importantly imply that there can be several items within the focus of attention at the same time.

The fourth and last function proposed by Baddeley is suggested to provide a *link between working memory* (activated long-term memory and the focus of attention) *and long-term memory representations*, which serves as the basis of the content-oriented position that material in working memory fundamentally are long-term memory representations at a higher neural activation level.

Fougnie (2008:2) highlights that there is evidence that the above mentioned attentional processes can affect early perceptual processing, which would correspond to focusing attention to an unfamiliar new stimulus perceived by vision, for example, as well as later stages of processing, which would correspond to switching attention between concurrently held material within the focus of attention, enabling a more controlled output after processing. Fougnie concludes that the focus of attention "refers to the processing or selection of some information at the expense of other information", which clearly implies that there is a capacity limitation to the focus of attention.

It is an age-old debate to put a number on the limits of the focus of attention (partly still under the concept of short-term memory capacity), and the results have varied considerably according to the experiments that were carried out in order to quantify the capacity limit. A groundwork called "The Magical Number Seven, Plus or Minus Two" by George A. Miller (1956), introducing the concept of information chunks instead of single items, obviously limited the attentional capacity to something in between five and nine chunks of activated long-term memory. Simon (1974:482) who reinvestigated Miller's claim concluded that the constant capacity, which he estimated at five, was only a "rough approximation of the true state of affairs". More than another two decades later Rummer (1999:45) in a paper on cognitive load and conceptual planning of utterances again states that one cannot focus on more than seven chunks at the same time. It seems that whoever is looking for a finite number will not find satisfying results in the literature. Cowan (2005:10) calls this quest for a constant number "naïve constancy" and postulates a refined constancy approach that takes certain relativity, reflected by the different results of different experimental settings, into account.

In an attempt to biologically locate the focus of attention Cowan (2005:190) believes that areas in the parietal lobe, where supposedly also various incoming sensory material is integrated, can hold "pointers" to activated material in the posterior part of the brain. These pointers are the equivalent of the central executive processes directing attention to activated long-term memory representations. When it comes to estimating a quantified capacity of the focus of attention, however, he points out that it might not be the maximum number of pointers that could be held at the same time, but the number of independent and not interconnected chunks of information that can be pointed to, which he limits to about four.

For the purpose of the current research a finite number for attentional capacity is not crucial, but from the discussion above we get an idea about the range we can focus our attention. What is important, however, is that the focus of attention appears to be limited to a rather small number of information chunks that can be dealt with concurrently. Cowan (2005:191) sees possible neural interference as the main reason for a relatively small capacity limit. Since working memory processes are believed to be neural reverberations across competitive networks of the human brain, which depend on specific excitation and inhibition parameters between the range of three to five items (Usher et al. 2001:151, quoted in Cowan 2005:186), Cowan concludes that without such a small capacity limit "activation of the memory system would go out of control if capacity were not limited to about four items at once", pointing out that the costs of the capacity not being larger are outweighed by the benefits of the smaller capacity (2005:166).

4.4.3 Capacity limits of the activated long-term memory

As opposed to the focus of attention, where it is believed that only a limited number of information chunks can be held concurrently, activated long-term memory, as the complementary portion of working memory, appears to have limits of a different nature. Ericsson and Delaney (1999:290) state that "there is no universal capacity limit for how much information can be kept accessible during the performance of a specific task", which strongly contrasts the limitations of the focus of attention. Nevertheless, several authors point out that activated long-term memory shows limitations of two sorts. Cowan (2005) as well as Baddeley and Logie (1999) identify them as INTERFERENCE EFFECTS on the one hand, and TEMPORAL DECAY on the other hand.

The first kind of capacity limitation for activated long-term memory is interference based. In a simplified way, this means that when long-term memory material receives a heightened activation but shares many similar features of previously activated long-term memory material already in working memory, the latter might lose the neural activation strength necessary to be maintained at the same level and be "forgotten". Studies of fan effects (i.e. Cantor and Engle 1989) have corroborated support for interference-based limitations. Cowan (2005:51) describes that such effects result in situations where there is a retrieval delay from memory due to the similarity of other concepts or associates in working memory. In conclusion he notes that the interference-based component of capacity limitations to the activated long-term memory is based on how well conflicting incoming items can be suppressed.

A similar point is made by Schneider (1999:360), whose so-called CAP2 memory model also attributes certain limitations of activated long-term memory to the possible similarity of related codes used for working memory. Baddeley and Logie (1999) also see interference as one source of limitation to the activated part of long-term memory, but more specifically than others, they believe that it only applies to visuospatial and not verbal working memory. In their multiple-component model, we find the visuospatial sketchpad which is further fractionated into a storage component (visual cache) and a rehearsal component (inner scribe). According to the authors of the model, mostly the inner scribe's capacity is affected by interference.

The second kind of capacity limitation for activated long-term memory is natural activation decay over the passage of time and receives broad support in the literature. A neurological explanation can be found in Lamb's (1999:361) relational network model, which is based on impulses of cortical neurons spreading to other neurons and expanding activation to connected neural networks. It is based on the assumption that these neural impulses "produce" our memories, but that the activation must be kept alive via renewed neural impulses in order to be maintained. Along this idea, Lovett et al. (1999:176) argue that there is source activation energy for neural activation that is limited. This source activation energy has to be shared to the extent that a more complex task requiring the activation of several areas will result in less energy for each individual part, or in other words, the more neighbor nodes require activation, the smaller the shared portion of the total source activation energy for each neighbor node.

While not going into details on the neurological premises for a temporal decay of activated long-term memory, Baddeley and Logie (1999:32) attribute some of the limitation to trace decay in the activation networks, explicitly for the phonological loop, responsible for verbal working memory. Therefore, they included within the multiple-component model an active rehearsal sub-component for the phonological loop, responsible for the maintenance and reactivation of the task-relevant material to enhance performance. Similarly, Ericsson and Delaney's (1999:290) model includes rehearsal as possible option to maintain information in activated state, although in their case the rehearsal component is integrated on the presumption that there is a capacity limit for activated long-term memory in the first place.

Cowan (1999:68) attempts to set a time range on activated long-term memories. Although having previously cautioned about looking for a "naïve constancy" in the focus of attention, he argues for activated long-term memory that "the evidence from various types of stimulus and coding modalities suggests that there is a time limit in the activation of memory, with activation fading within about 10 to 20 s unless it is reactivated". This estimation is in accord with Fougnie (2008:3) who also mentions that the temporary store of working memory lasts on the order of seconds only.

On a concluding note, an interesting point is made by Kieras et al. (1999:213) who also implement temporal decay into the partitions of working memory of their computational EPIC model. They argue that the rate of temporal decay is not linked to the number of items held in activated long-term memory. It is the only model to investigate such a potential interrelation.

4.4.4 Chunking as solution to capacity limits

Already in section 4.4.2 the concept of information chunks has been introduced. The theory of chunking, first introduced by Miller (1956), gives an account of how we can enlarge the amount of information in working memory despite the established limitations both of the focus of attention and the activated portion of long-term memory.

The chunking hypothesis is briefly described by Cowan and Chen (2009:86) as the "combination of multiple items to form a larger, meaningful item". They offer an example of a letter sequence consisting of 9 items:

i-b-m-c-b-s-r-c-a

With long-term knowledge, as a precondition for chunking in this case, the strategy of grouping these letters into familiar chunks can be applied. If one, for example, recognizes the acronyms of three large American corporations within the letter sequence, the resulting chunks would look like this:

IBM – CBS – RCA

Compared to the initial sequence the new chunked version reduces the item list from 9 single letter chunks to 3 multi-letter chunks. This can essentially be performance enhancing regarding both the capacity limits of the focus of attention and activated long-term memory. For the former, with a presumed limit of approximately 4 chunks, arises the opportunity to practice building even larger chunks, i.e. up to 4 chunks or to increased four-letter chunks, in order to enlarge the actual information within the focus of attention. For the latter, with its presumed time-limitation that requires rehearsal and refreshing of the activation to prevent it from decay, more information can eventually be kept active in activated long-term memory with reactivation of a reduced number of cues, namely the cue for an entire chunk, instead of the individual parts it consists of. Cowan et al. (2006:277) point out that grouping information into larger and larger chunks in addition to covert rehearsal can be seen as one mnemonic strategy that can "supplement a basic working memory capacity".

In a similar way, Cowan and Chen (2009:87) point out that phone numbers might be kept in working memory the same way, splitting a ten digit phone number, such as 0-7-9-4-6-8-7-1-3-0 into four chunks 079-468-71-30. Therefore, phone numbers often are displayed in chunk sizes, with dashes or slashes already grouping the elements. Apparently, even though there might not be a long-term memory cue for a number such as 468 in the second chunk, practice and routine allow for the activation of a three digit number to enhance performance of the limited working memory. This is in accordance with Cowan and Chen's (2009:92) claim that while at the bottom line more information can be kept in working memory due to strategic chunking, the procedure tends to increase the size of the chunks rather than the number of chunks as a total. Therefore, the chunking hypothesis can be seen an optimization within the boundaries and limitations of working memory.

Along the same lines, Simon (1974:483) has already suggested that the total number of chunks might be fixed, but that one can increase the number of items in working memory simply by building larger and larger chunks. Initially, Simon set out to define chunks in terms of verbal content, testing individual syllables in experiments of immediate recall for words and phrases as single chunks. In a consecutive step, the experimental design was changed to treating whole words as chunks, producing still very vague results. Acknowledging that the chunking hypothesis does not assert any specific verbal content as chunk he concludes that "units much larger than words may be highly familiar, hence may serve as chunks", which brings us closer to the idea of whole phrases prepared in long-term memory that could serve as chunks, using relatively little of the rather narrow capacity of the focus of attention.

The aspect of training the process of chunking was investigated by Bower (1969:610) who observed improved recall with practice, because parts of a chunk might get strongly bonded to the extent that then several chunks can coalesce into a single chunk by creating mental subgroups in a hierarchical manner. Therefore, larger chunks such as pre-established word groups, idioms, clichés, etc. can under certain circumstances count as a single chunk and behave like "single words in recall, in terms of their recall or in terms of their effect on the recallability of other units from memory" (612).

4.5 Summary

The chapter set out to define the concepts WORKING MEMORY and CAPACITY LIMITS. For the former, two seemingly different working memory models (the multiple-component model by Alan Baddeley and the embedded-processes model by Nelson Cowan) were introduced. In a discussion including ideas and models of several other authors, the following areas of theoretical consensus were formulated: Working memory is a capacity-limited set of mental processes or mechanisms which is used to control, regulate and maintain information for complex cognitive tasks and shares a close relationship with long-term memory.

A two-fold structure of working memory has been suggested in order to investigate working memory's capacity limits. Based on Cowan's model the focus of attention and the activated part of long-term memory were focused on separately.

As for the FOCUS OF ATTENTION, there is evidence that the capacity can be measured in terms of information chunks. However, in the literature the concept of a "chunk" remains somewhat abstract, which makes it impossible to point out in much detail how much information one can hold in the focus of attention simultaneously. Most studies presented suggest that the capacity is rather small (estimated at about four chunks) – which presumably is more beneficial in terms of efficiency than a larger capacity would be. Binding of information into larger individual chunks has been identified as the solution to working memory overload caused by the limitations of the focus of attention.

ACTIVATED LONG-TERM MEMORY has no limitation in how much information can be held at the same time, but there are two limiting factors of a different nature. Interference effects from similar items and a natural temporal decay of the neural activation (according to Cowan after 10-20 seconds, if not renewed) can lead to an information "loss" within working memory. Reactivation or activation maintenance through attention has been identified as the solution to working memory overload caused by the limitations of the activated long-term memory.

5 LONG-TERM MEMORY ADVANTAGES

"Unlike a computer, the normal human brain never reaches a point at which new experiences can no longer be committed to memory; the brain cannot be full".
Cowan (2005)

5.1 Introduction

In the previous chapter we have established the characteristics of working memory as a capacity-limited set of mental processes with close ties to long-term memory that is used to control, regulate and maintain information for complex cognitive tasks. If we assume now that a task, such as producing an immediate spoken coverage of continuous visual stimuli, requires mental resources that exceed working memory capacity, but can still successfully be achieved, then long-term memory seems to be the place of this solution.

The current chapter will look at the different systems within long-term memory and the biological principles according to which long-term memory representations are formed and stored. Furthermore, two sections will demonstrate how long-term memory enables and allows for a high degree of automaticity and how it can accommodate entire speech formulas.

5.2 Long-term memory systems of language and thought

Kuiper (2004:52) writes that "we have an immense capacity to remember, and to retrieve very quickly from memory what we need", referring on the one hand to the unlimited capacity of long-term memory for the storage of our conscious knowledge about the external world and on the other hand to the various processes and abilities that we are not aware of performing constantly. These two kinds of knowledge, explicit memory and implicit memory, are the focus of the following two sections.

5.2.1 Explicit, declarative memory

Explicit memory, to which a speaker has conscious access, is also referred to as declarative memory in the literature. Levelt (1989:10) describes it as "the speaker's structured knowledge of the world and himself, built up in the course of a lifetime". It is stored in long-term memory and as previously pointed out; there is no known capacity limit for declarative memory. However, this permanently available ENCYCLOPEDIC KNOWLEDGE is only one part of our explicit memory, because we can also have declarative knowledge about present and ongoing state of affairs that have not previously been encountered for storage. This part of declarative knowledge is termed SITUATIONAL KNOWLEDGE by Levelt and illustrated with the example of two interlocutors creating a discourse record by keeping track of what is said during a conversation, in order to maintain the situational model for the ongoing interaction. Especially with respect to event description, and sports commentary as current data in particular, situational knowledge in combination with encyclopedic knowledge is of great importance.

Long-term memory allows for multiple representational systems, and declarative knowledge for thoughts can take many forms of coding. Levelt (1989:72) points out that spatial representations and propositional representations are the two most studied modes of declarative knowledge and explicit memory. Nevertheless, he mentions a wide range of additional systems suggested partly by other authors: sequential event structure representations, kinesthetic codes, sense-related systems (i.e. for smells, sounds, tastes). The main argument by Levelt is that, while for thoughts one can switch between or potentially even combine different representational modes, every preverbal message resulting from the conceptualizer must be in propositional format. In other words, before thoughts can enter the formulator they are always transformed into semantic representations that express a relation between concepts. According to Levelt (1989:72) a proposition is always either "true or false of the state of affairs it refers to, and we are endowed with a rich system of procedures for evaluating the truth or falsity of propositions on the basis of the truth or falsity of other propositions". In section 5.2.3 the propositional representational system essential for language production will be focused at in more detail.

5.2.2 Implicit, procedural memory

We use procedural knowledge for cognitive and motor skills. A good example of implicit procedural motor skills would be riding a bicycle. Through repetition we practice certain proceedings so that eventually they will be automatized to the point that we do not require much conscious attention to perform them. Similarly, we apply procedural knowledge to encyclopedic and situational knowledge for cognitive skills, such as language production, in order to transform them into semantic preverbal messages. These procedures also must be learned, are stored in long-term memory as implicit memory and are generally outside of our awareness.

Levelt (1989:10) explains procedural knowledge for a proposition as a "system of condition/action pairs". Each speech act has a specific conceptual formula; the formula "if X then Y" for example will express an assertion. Variables are purposely chosen to point out where declarative knowledge is inserted. The variable X stands for a condition that is to be met for action Y to occur, communicating that the speaker intends to commit himself to the truth of the proposition, and therefore asserts it by choosing this conceptual formula.

Such speech act algorithms are crucial in transforming declarative knowledge into a preverbal semantic message for the formulator. However procedural knowledge is not confined to conceptual representations. As Levelt (1989:18) points out, grammatical and phonological encoding relies on condition/action pairs of implicit procedural memory just as much, and similar (language-specific) algorithms can be formulated.

5.2.3 Semantic entities in long-term memory

Everything the human mind experiences and encodes in long-term memory is organized in categories, from which propositions and declarative messages can later be created. Table 4 shows ten semantic categories introduced by Levelt (1989:78) and illustrated with examples.

Category	*Example*
PERSON	John
THING	Surfboard
EVENT	I found a job
ACTION	Hold one's breath
STATE	The water is warm
TIME	Next year
PLACE	In Hawaii
DIRECTION	Towards the beach
ATTRIBUTE	Blue
MANNER	By foot

Table 4 Semantic categories in long-term memory (after Levelt 1989)

Levelt suggests that only the categories of EVENT and STATE are complete propositions, exemplified by complete and grammatical sentences in the right column of Table 4. All other categories are elliptical, less complex and refer simply to a certain concept – and not more.

Every message that is conveyed by means of language can be broken down into the semantic categories presented above, as shown in several sample representations by Levelt (1989:75-106). To illustrate this point we first take the simple but complete propositional construct of STATE from Table 4: *the water is warm* consists of the subject *water* and the predicate *is warm.* The subject and the predicate again fall into semantic categories, with *water* being a THING and *warm* an ATTRIBUTE. This relation can be represented in a diagram, in which the state function is expressed by the concept *be.*

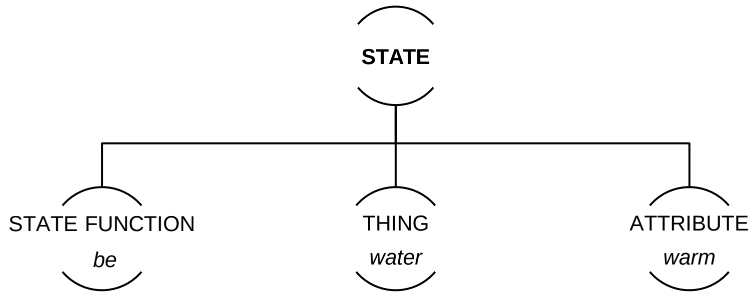


Figure 14 Semantic category representation of a simple state
Diagram representing the proposition *the water is warm.*

In contrast to the STATE diagram above, an identical approach to a more complex utterance as *John saw that Joe left the surfboard at the beach* looks far more complex. The main category of this sentence is an EVENT consisting of a number of other categories shown in Figure 15.

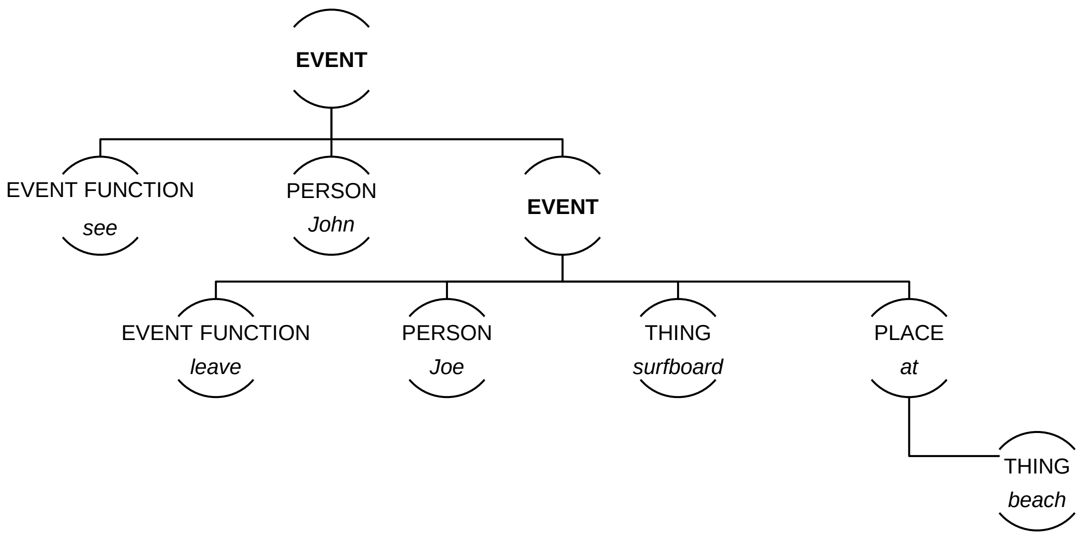


Figure 15 Semantic category representation of a complex event
Diagram representing the proposition John saw that Joe left the surfboard at the beach.

Despite its complexity, except for the EVENT FUNCTION every other concept falls into one of the above mentioned categories as well. It is merely the structure that becomes more complex, with sub-levels illustrating the conceptual hierarchy. There is much combinatorial room with the introduced ten categories. A combination of categories can merge into another category (e.g. THING + ATTRIBUTE → STATE in Figure 14, or [THING + PLACE + PERSON → EVENT] + PERSON → EVENT in Figure 15) of higher hierarchy and eventually the "synergy" of the sum of all parts leads to one main proposition.

The conceptual structure of propositions and the organization into semantic categories is not only valid for speech production from thought to an utterance. Levelt (1989:74) points out that our comprehension system will deconstruct a spoken proposition in exactly the same way. The utterance *John saw that Joe left the surfboard at the beach* will not be "memorized verbatim; rather, the memory trace is propositional, i.e. in terms of entities referred to and relations holding between these entities", which leads to question of how exactly information is encoded in long-term memory.

5.3 Biological principles

The chapter on the biological principles of long-term memory is dedicated to explain in more detail how new information is stored and embedded in procedural and declarative memory. In a next step, these principles will be applied to long-term memory's potential in working memory tasks with the focus particularly on language production.

5.3.1 How new links are formed and information is stored

Earlier in chapter 3 it was already mentioned that the human brain functions with neural networks. According to Lamb (2004:244), "the information of a network is embodied in its connectivity", that is, in the connections between cortical neurons. Some quantitative estimates by Lamb (1999:318) suggest that our human brain has over 100 billion such neurons, with each neuron being connected to around 1'000 other neurons by roughly 40'000 synapses. Some of these network properties are pre-established by our DNA, by "evolutionary learning" so to speak, and do not have to be created entirely from scratch. However, if we wish to learn new things and store them in our long-term memory it is necessary to form new synaptic connections between cortical neurons, or at least strengthen the pre-existing but latent ones to the extent that they become stable networks to hold the intended information.

Every learning process is a biochemical structural formation or strengthening of the connection between a sender (presynaptic) neuron and a recipient (postsynaptic) neuron, in contrast to the neuro-electric reverberations between neural networks in working memory mentioned by Usher et al. (2001:151, quoted in Cowan 2005:186). In neuroscience this process is termed LONG-TERM [SYNAPTIC] POTENTIATION. It is characterized by Hebb (1949:67, quoted in Klimesch 1994:194) as increased efficiency between two neural networks due to some growth process or metabolic change that occurs when one network repeatedly or persistently excites another network. These newly formed links that associate one network with another can further link the initial sender network to those networks that have already established synapses with the recipient network. It follows that a neural network can later be activated by incoming connections other than those it established itself, as illustrated in Figure 16.

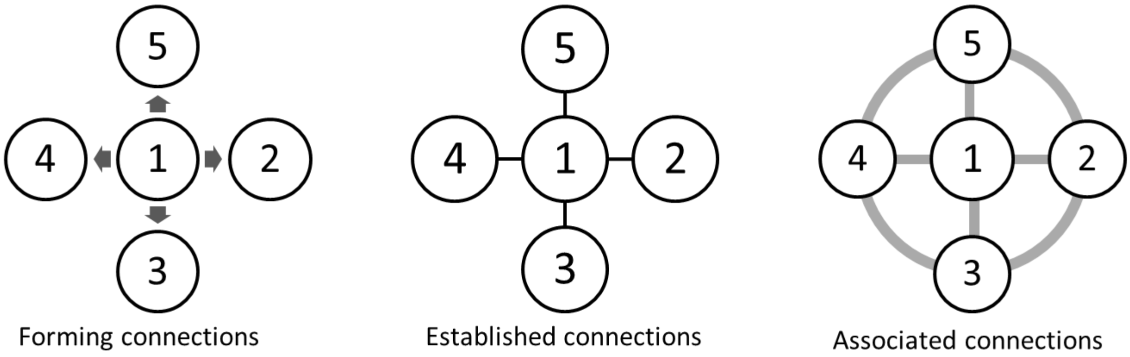


Figure 16 Forming new links in long-term memory
A neural network 1 forms new synaptic connections to related networks 2,3,4,5. Once new synaptic connections are established the associated networks 2,3,4,5 can activate each other as well, if their activation strength is above the respective threshold.

After several activation cycles that form new synapses and further strengthen the established and associated connections, a neural network can respond to a very complex combination of activation: This is the learning process of long-term memory termed ROUTINIZATION.

5.3.2 Long-term memory's role in working memory tasks

A research team around Klingberg (2009:66) experimented with virtual nerve cells, simulating working memory, and concluded that stronger connections between cells, unlike faster connections that would transmit more efficiently (which was tested as counter-hypothesis), were more able to retain mnemonic activity with associated content even when exposed to distraction. With the knowledge about how new synapses in long-term memory are formed and established or strengthened and connected to associated neural networks, one can conclude that Klingberg and his colleagues produced evidence that the procedure of long-term memory learning introduced in section 5.3.1 is suited well for the storage, integration and retrieval of information during a working memory task, because it directly affects connectivity strength.

Jackendoff (2002:131) suggests that routinization occurs already at the lowest levels of binding material to a fully operational lexical item. If we take the word *beach* for a stretch of sand or pebbles near the sea or another area of water as an example, then there must be a lexical entry holding information not only of the concept itself, but a combination of semantics, syntax, and phonology. Figure 17 applies Jackendoff's "three-way interface rule" to the word *beach* to show the different representations that are associated with the concept and stored under the one single lexical entry.

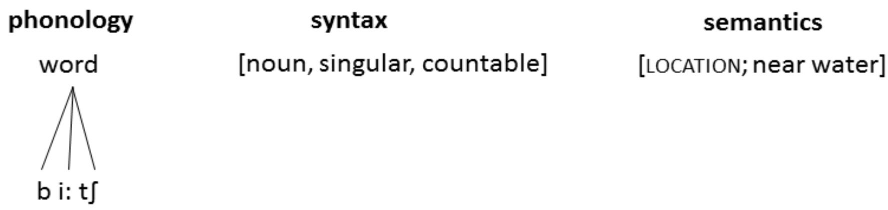


Figure 17 Phonological, syntactic, and semantic representations (after Jackendoff 2002)
Stored representations for the lexical entry *beach.*

Theories supporting that this long-term memory ability to bind phonological, syntactical and semantic information and store it under one lexical entry is supportive in working memory tasks are called PRE-RETRIEVAL ACCOUNTS by Thorn et al. (2009:202). According to pre-retrieval theories information binding occurs already during the stages of encoding and storing new information via the focus of attention.

Cowan and Chen (2009) researched exactly this phenomenon and explain how new association are remembered with an interplay between long-term memory and working memory. What is valid for single neurons or neural networks also appears to be applicable on a more complex level, such as the binding of several lexical items to structures as large as phrases or word lists. A classical experiment for such research is the immediate recall test of a list with several items that participants have to memorize and reproduce at a later stage. Illustrated in Figure 18, there are five different phases of this learning process. While in phase a) the five symbolic lexical items are not content of working memory yet, phase b) displays the identical elements as part of working memory's activated long-term memory. In terms of activation strength three items in the example receive extra resources when they become the focus of attention in phase c). The elements within the focus of attention are "registered" as co-occurring, leading to the establishment of connections between them and the storage of the structure that remain associated even when in phase d) the three elements are no longer in the focus of attention. With continuous training, that is, repeated co-occurrences of the elements, connection strength heightens each time and can result in a long-term memory representation of the structure as a whole.

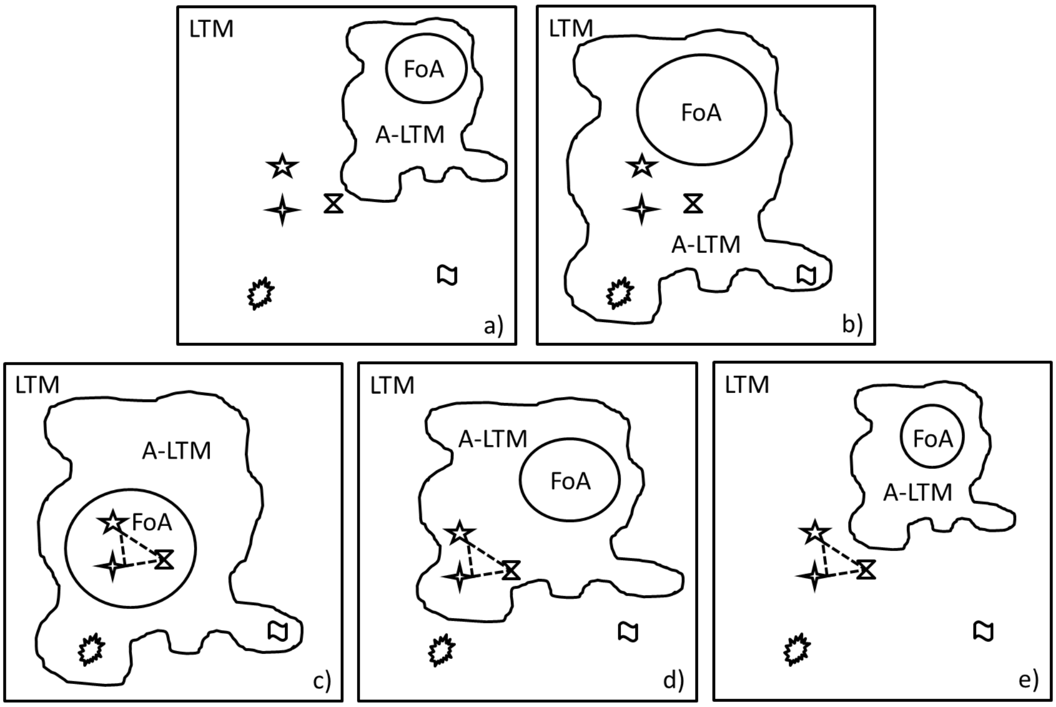


Figure 18 Remembering new associations between items (after Cowan and Chen 2009)
Five phases a) - e); from unconnected items in long-term memory (LTM) via activated long-term memory (A-LTM) and the focus of attention (FoA) to associated connections outside working memory.

Another account of how long-term memory affects working memory is termed REDINTEGRATION and is again mostly researched with immediate recall tests. In the views of the redintegration theory described by Thorn et al. (2009:200) long-term memory effects on working memory tasks "arise through the differences in the accessibility of long-term representations which influence the degree to which the reconstruction process is successful". Accordingly, established representations can reconstruct information in working memory when traces of elements that are no longer in working memory are accessed. What clearly differentiates redintegration from pre-retrieval account is that the former is restricted to a stage after the initial storage in long-term memory, while the latter occurs during storage. Even though there is competition between the two views in the literature, there is not enough evidence to suggest that only one account is valid and that they cannot co-exist. For the present purpose, however, the important conclusion is that both theories are based on the connectivity strength principles introduced above and attribute an important role of long-term memory in working memory tasks.

One of the most important aspects during a working memory task is fast and efficient retrieval of long-term memory knowledge. While our declarative encyclopedic knowledge can have different modes of representations (see section 5.2.1) our lexicon that we use for language is organized semantically. Therefore, in tasks that include language comprehension or production there is a mechanism called SEMANTIC PRIMING which makes use of routines that were formed and stored in long-term memory. Priming operates with implicit memory, more specifically with the associations that are built from one conceptual network to related ones. When one of these networks gets activated, it will unconsciously pre-activate (prime) the associated networks, which increases efficiency in working memory tasks dramatically. Holcomb and Neville (1990:282) investigated semantic priming in auditory and visual modalities and concluded that auditory stimuli lead to more significant priming than visual stimuli. Nevertheless, lexical choice appears to be facilitated by either modality of stimulus.

Whereas priming is most efficient within a single modality (e.g. visual stimulus priming other visual representations) it is not modality-exclusive, because the process results from a bottom-up activation of a lexical item to its associated items, which means that a visual stimulus can activate not only the respective suitable lexical item, but also properties of a related lexical item (e.g. phonological representations).

The largest advantage of pre-retrieval binding, redintegration and priming as long-term memory phenomena in terms of aiding performance in working memory tasks is the degree of automaticity that they allow. These processes all operate on procedural rules stored in our implicit long-term memory and therefore presumably do not require working memory resources.

5.3.3 Implications for language production

Routinization is encountered in language acquisition and learning as well as online during language comprehension and production. The previous sections pointed out the biological principles according to which long-term memory can learn and store new items and links between items, from a single neuron's activation to larger and more complex structures such as our lexicon. With respect to formulaic language, however, conclusions from priming drawn by Baddeley and Logie (1999:38) are of great interest. They support the assumption that priming of structures much larger than lexical items is possible. Also Garrod and Pickering (2007:14) suggest that idioms, stock phrases, some clichés and in extreme forms whole speeches used in everyday language are routines. Once they are memorized they can be accessed directly, without constructing them.

How large structure routines are formed and stored in long-term memory is presented by Garrod and Pickering (2007:15). There are two significantly different ways of binding several lexical items into a new lexical entry. The first kind that will be discussed is the COMPOSITIONAL ROUTINE, in which the individual meanings add to a "sum meaning", as illustrated in Figure 19. Applying Jackendoff's "three-way interface rule" to the compound *beach break* there are phonological representations of both nouns linked to the syntactical characteristics of the compound. In the case of *beach break* both constituents are countable nouns in the singular, resulting in the $[\text{syntax}]_3$ representation. Identically, the semantic representation of this routine $[\text{semantics}]_3$ derives from the addition of the meaning of each constituent: an interruption or notable change at a stretch of sand or pebbles near the sea or another area, as in a cliff-like shaped sand dune at the sea due to erosion of water and wind.

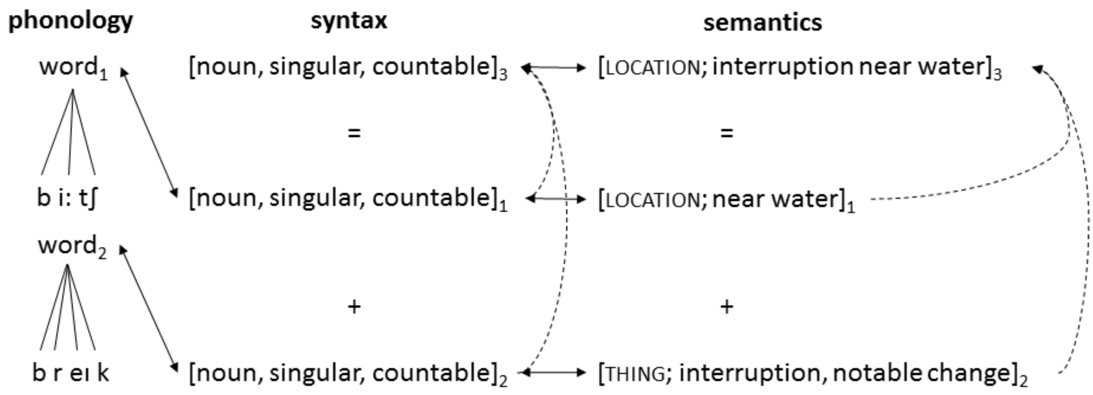


Figure 19 Compositional routine (after Garrod and Pickering 2007)

Admittedly, the compound *beach break* will hardly be memorized with its compositional meaning, because one does not encounter this expression in that sense very often. Nevertheless, the given example show how information is bound to an additional meaning which can be stored as a new lexical item with all associated representations.

Most likely, the compound *beach break* is stored with an idiosyncratic semantic meaning, as in Figure 20. People familiar with maritime conditions and expressions know that a beach break is a specific term for the way in which the shape of the seabed affects waves in the ocean. While in the idiosyncratic routine the phonological and syntactical representations behave exactly like in the compositional routine, the difference lies in the newly formed semantics.

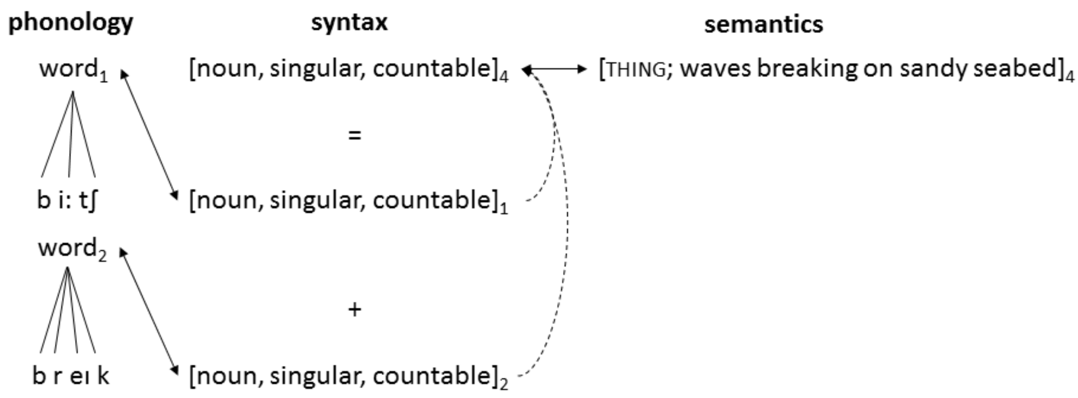


Figure 20 Idiosyncratic routine (after Garrod and Pickering 2007)

The fact that the compound's meaning [semantics]$_4$ cannot be inferred from its constituents is not necessarily a disadvantage for the learning process of the routine, if we consider that routines emerge when elements co-occur frequently. Since the idiosyncratic meaning of *beach break* has a much higher frequency in use than its compositional counterpart, it will in fact be integrated easily into a stable structure in long-term memory despite the lack of "logical" compositionality.

5.4 Formulaic language and long-term memory

Formulaic language or pre-fabricated expressions consist of linguistic routines that come in a variety of different disguises. Some speech formulas are as small as the expression *beach break* that was used earlier as an example, others are as large as a complete sentence. And while some are stored under a compositional semantic entry in the lexicon, others have an idiosyncratic meaning.

The current chapter attempts to clarify what speech formulas are, what they can look like, and what the advantages are of having stored such formulas in long-term memory as fixed structures.

5.4.1 Speech formulas as phrasal lexical items (PLIs)

In one of his most recent books on formulaic speech, Kuiper (2009:4) distinguishes our vocabulary items along the parameters of linguistic and non-linguistic conditions of use. The word *beach* for instance would be a lexical item with linguistic conditions of use in the sense that it is a noun and as such it is for example not entirely free in its sentence position, due to grammatical rules of the language system. In contrast, the word *yes* does not belong to a specific syntactic category and therefore has little linguistic conditions of use. However, a lexical item can also have non-linguistic conditions of use, which refer to the speech context and environment in which it can be used, for example. The compound *beach break* for instance may not be well known to many conversational partners and the knowledge about the word being part of a jargon is important.

Kuiper (2009:5) approaches the definition of speech formulas by characterizing them as PHRASAL LEXICAL ITEMS and adds that they always must have linguistic conditions of use, "because phrases by definition have syntactic categories which determine where they may be used in sentences". Formulas can both be verb phrases or noun phrases, and also function as such in a sentence. As for the non-linguistic conditions of use, Kuiper mentions that PLIs may or may not have them: Some phrasal lexical items are clearly restricted to particular communities, speakers or occasions, while others have become lexical items that are fully integrated in a language vocabulary.

A key point for the hypotheses of the current research is made by Kuiper (2009:14), claiming that phrasal lexical items have their own entry in the mental lexicon of a speaker. Therefore, consistent with the chunking hypothesis introduced in section 4.4.4, it is possible to retrieve whole phrasal structures by activating only one lexical item consciously. This automatizes the speech production process on several levels to a large extent. Many of the steps mentioned by Levelt in chapter 7 will apply to the speech formula as a whole instead of each individual component of the phrasal lexical item. Which of the steps are presumably bypassed by making use of PLIs rather than constructing a sentence entirely from scratch will be the main task of the core analysis in the second part of the paper.

5.4.2 Sample of a formula stored in long-term memory

Koenraad Kuiper and his colleagues have investigated speech formulas in a number of routine contexts which he calls FORMULAIC GENRES. They note that formulas, as pre-fabricated expressions, do not exclude novel content from entering and being formulated. In fact, the definition by Kuiper and Haggo (1985:170) clearly allows for certain flexibility: "A formula is a lexicalized piece of syntax with all the words supplied or with systematic gaps which are to be filled by one of a small set of possible fillers such as proper names". According to this characterization a formula will restrict the choice to a smaller number of options but enables still a richer language than an entirely memorized phrase or sentence.
The second point made by Kuiper and Haggo's definition is that since speech formulas are phrasal in their nature, they have syntactic structure. Kuiper and Austin (1990:209) reiterate the syntactic role of formulas and elaborate further that a finite-state grammar can be mapped onto them, which they explain as "a very simple form of grammar which can be thought of as a machine which moves through a finite sequence of states emitting a word as it moves from state to state". For a finite grammatical structure each formula that is not a complete sentence must be indexed for a particular role either as verb phrase or noun phrase, because it will go into a specific grammatical position within a sentence.

Bid calls	
At X	I have X dollar bid
X dollars	I have X dollars
X	At X dollars

Table 5 Six variants of bid calls (Kuiper 2000)
Variants used by an auctioneer during a real estate auction.

A simple illustration of how speech formulas are stored in long-term memory as prefabricated syntactical expressions is given by Kuiper's (2000:293) analysis of an auctioneer calling the bids at a real estate auction. In his auction transcripts Kuiper found six different bid calls, summarized in Table 5, where the variable X stands for a number value.

At first sight each way of announcing a new bid appears to be unique. This would correspond to a lexical entry of its own in the speaker's long-term memory for each of the variants. However, Kuiper found resemblances between the six variants of bid calling and ultimately placed them into two final state diagrams, providing evidence that the variants derive from only two lexicalized formulas.

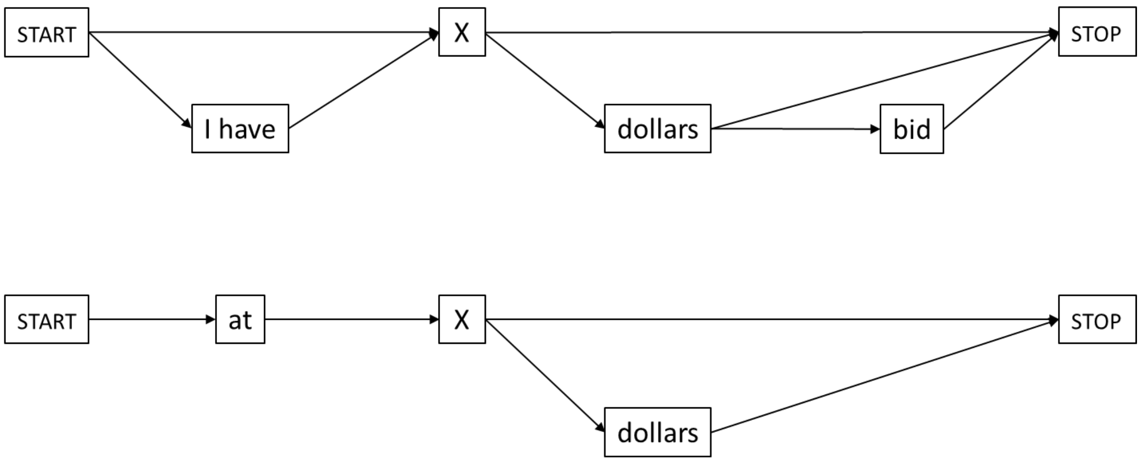


Figure 21 Finite-state representations of two bid-calling formulae (after Kuiper 2000)

From the finite-state representations of the formulas we can tell that there is a limited number of choices in generating an utterance. The most extensive version *I have X dollars bid* in the first formula of Figure 21 can be said to correspond to the phrasal lexical item as it is stored in long-term memory. All other variants of the formula, and most strikingly the one using only the variable *X* for a certain value, are elliptical forms of thereof.

Kuiper (2000:294) notes that "if formulae were freely generated syntactic structures, then we would expect many more variants to appear than actually do". This would certainly be the case, but it appears that speech formulas offer enough choice in the generation of a message to ensure alternation and creativity by optional omission of some of the formula's constituents. Meanwhile, the most important characteristic in terms of efficiency and saving mental resources is maintained in every form: They all belong to the same phrasal lexical item and can be retrieved easily for working memory tasks by the activation of only one lexical item.

5.5 Summary

Our long-term memory knowledge consists of two different parts. On the one hand, there is our explicit declarative knowledge about the world that we acquire during our lifetime, and on the other hand we have implicit procedural knowledge consisting of algorithms according to which our declarative knowledge can be applied for specific purposes.

Even though the human mind uses different representational systems for thought, what is conveyed by means of language will ultimately have to be transformed into a propositional format. For that, everything we experience and encode in long-term memory is organized in semantic categories (e.g. persons, things, events, directions, etc.), which themselves can consist of other categories, as seen in the example *John left the surfboard at the beach*, where a person, a thing and a place together with the event function *leave* combine to an event.

The information that we have stored in our long-term memory is embodied in the connectivity between neurons and their networks. While a part of our neural networks are genetically predetermined there is still an unlimited capacity to build new synapses for the creation of additional networks that in turn are able to store information. This process is called routinization and is based on connectivity strength between networks, which can be "trained" with the help of working memory to the point that certain co-occurring structures become fixed long-term memory representations.

When larger structures, such as word compounds, are routinized they can assume an idiosyncratic meaning, which means that they are newly indexed as own lexical item. Such structures are stored similarly to compositional routines, with phonological and semantic features, but their meaning can often not be inferred from the meanings of their constituents.

Speech formulas are phrasal lexical items and besides their linguistic conditions of use (e.g. syntactical constraints for the positioning within a sentence) they can have non-linguistic conditions of use, as well. Especially when considering idiosyncratic routines it is clear that a speaker has to have certain knowledge about the speech environment in which the use of the formula is appropriate.

Finite-state representations of speech formulas show how they are memorized as a single structure and which variants can be generated by means of omitting particular elements of the formula. Speech formulas limit the choices for a speaker during the speech production process, but they are efficient in terms of using little working memory resources, because they can be retrieved from long-term memory by the activation of only a single lexical entry.

6 SYNTHESIZING A LANGUAGE-ORIENTED MEMORY MODEL

"Linguistics and brain science must merge."
Pulvermüller (2002:8)

In an attempt to summarize the findings from the chapters of the theoretical foundations the purpose of this rather short chapter is to implement them into a model for reference. The graphical depictions for each step of implementation are based on Cowan's embedded-processes model (1988, 1999) and are provided at the end of the chapter. For lack of space there cannot be one complete graphical illustration and so the memory model is split into its sub-components. Every consecutive embedding of a memory element always presupposes the previous structure.

I would like to stress that the ambition is neither to compete with existing models nor to claim revolutionary findings, but to visualize the theoretical consensus and findings that emerge from the preceding chapters with comprehensible step by step diagrams.

6.1 Embedding long-term memory

This chapter refers to:
Long-term memory in a language-oriented memory model on page 84.

Long-term memory (LTM) representations are embodied in the connectivity between cortical neurons and their neural networks (Lamb 2004:244) and there is no known capacity limit (Cowan 2005). There are two kinds of long-term memories according to Levelt (1989:10). On the one hand there is an explicit memory and on the other hand there is an implicit memory. The explicit memory is often referred to as declarative memory and the implicit memory as procedural memory. This distinction splits the long-term memory part of the model in two separate parts.

Implicit memory comprises motor and cognitive skills and consists of condition/action pairs that are applied during the processes of the language production components: conceptualizer, formulator, articulator (Levelt 1989).

Explicit memory is divided into encyclopedic and situational knowledge (Levelt 1989:10), which both can have the form of multiple representational systems (Levelt 1989:72). Examples of different representational systems include spatial, sequential, kinesthetic or sense-related systems, but the most important one in terms of language production and comprehension is the propositional representational system. It is central for language, because it organizes long-term memory representations in semantic entities (Levelt 1989:78). Everything we store in long-term memory as persons or things, events and actions, state of affairs, time or place, directions, or attributes and manners is indexed for one of these semantic entities, so that retrieval for a lexical item is speeded up by first selecting the right index. It is similar to having a very well-arranged and thought-out folder structure on a personal computer to avoid having to scan through endless amounts of documents to find a particular one.

Our encyclopedic knowledge holds our lexicon, which can be further fractured into five different lexica (Wray 2002:263): a grammatical lexicon, referential lexicon, interactional lexicon, memorized lexicon, and reflexive lexicon. The contents of these lexica can range from lexical items as small as single morphemes that are used to assemble words and phrases to larger fixed speech formulas such as numerals or proper names (see 2.4.1). Most interesting for the current research, however, is that according to Wray even entire complex syntactic structures with open slots for lexical selection can be stored in the long-term memory lexicon - the semi-productive speech formulas.

6.2 Embedding working memory

This chapter refers to:
Working memory in a language-oriented memory model on page 85.

Cowan’s (2005) definition describes the structure and function of working memory as a set of processes or mechanisms which is used to control, regulate and maintain information for complex cognitive tasks. It is therefore functionally but not structurally different from long-term memory (Baddeley and Logie 1999:31). This means that working memory also works with connectivity between cortical neurons and neuronal networks (Lamb 2004:244). Most of its contents are long-term memory representations on a higher neural activation level (Miyake and Shah 1999b). Cowan's (1988, 1999) approach of embedding working memory into long-term memory is adopted in the current model, because it better reproduces this intrinsic structural equality.

According to a general consensus derived from Miyake and Shahs (1999a) discussion of different memory models, working memory can be divided into a component of activated long-term memory (A-LTM) elements and a component of items that are in the focus of attention (FOA) for immediate processing.

In activated long-term memory are those elements of long-term memory that have been activated above a certain threshold. The threshold for each long-term memory representation is different and can be subject to modification according to needs. Low thresholds for prototypical or routinized representations, for example, automatically lead to quicker and therefore more efficient activation and retrieval. The capacity of A-LTM is limited in terms of interference of similar items and time (Baddeley and Logie 1999, Cowan 2005). After an estimated 10-20 seconds there is a decay of the neural activation and the affected long-term memory representations are no longer available for the immediate use in a complex cognitive task. A solution to this is a constant reactivation or activation maintenance through attention. Despite these temporal and interference limitations there is no known limit of the amount of information that can be activated in A-LTM (Ericsson and Delaney 1999:290).

The focus of attention, on the contrary, is limited in terms of number of information chunks that can be held at this highest possible activation stage (Usher et al. 2001:151, Cowan 2005:166, Rummer 1999:45). We find no clear consensus on an actual maximum number, but a tendency towards the limit being not much higher than 4 chunks for practical reasons. A solution to this limitation is the binding of information into larger and larger chunks, a technique often applied when one has to remember a telephone numbers, for example: splitting a ten digit phone number into groups of 2-3 digits results in four to five chunks of information, reducing the number of chunks that should be remembered immediately but exceed the capacity of the FOA by more than fifty percent.

Once certain elements are in the FOA concurrently it is possible that associations between these elements are stored as own lexical entries in long-term memory. This is the dynamic of the lexicon that essentially allows the establishment of speech formulas.

6.3 Embedding the central executive

This chapter refers to:
The central executive in a language-oriented memory model on page 86.

The central executive has the function to direct attention and to control voluntary processing. There are three different processes at work (Baddeley 2007:117). It can focus attention on long-term memory representations in order to increase their activation level and make them available in activated long-term memory. If the central executive focuses attention on a representation that is already in A-LTM it will move into the FOA.

The other two processes controlled by the central executive include switching and dividing attention between concurrently held items within the FOA (Baddeley 2007:117). This is necessary within the focus of attention component where several items are held at the highest possible activation state.

In order for a long-term memory representation to get into the focus of attention it is therefore necessary that the central executive focuses attention to it.

6.4 Embedding stimulus perception

This chapter refers to:
Stimulus perception in a language-oriented memory model on page 87.

Through our sensory systems we perceive a constant flow of stimuli. Familiar stimuli can activate long-term memory representations directly, which in terms of sports commentary implies that routine event representations can be readily available in activated long-term memory. Novel stimuli on the other hand require the central executive to make them available in working memory. This can occur either when a stimulus elicits attention from the central executive, or when attention is voluntarily directed outwards to a stimulus (Cowan 1999:64).

An additional component termed CONCEPTUAL SHORT-TERM BUFFER and postulated by Coltheart (1999) is included in the language-oriented memory model. It is responsible for an early pre-selection and rough analysis of this stimuli flow, which is based on Cowan's (1999:64) BRIEF SENSORY STORE and Potter's (1999) CONCEPTUAL SHORT-TERM MEMORY. The system is tightly linked to long-term memory as it can elicit attention from the central executive, which will then activate long-term memory representations (Coltheart 1999), and can process an estimate of eleven items per second.

On the following pages step by step diagrams visualizing the four discussed memory components are provided as a reference model.

6.5 Step by step diagrams of the model

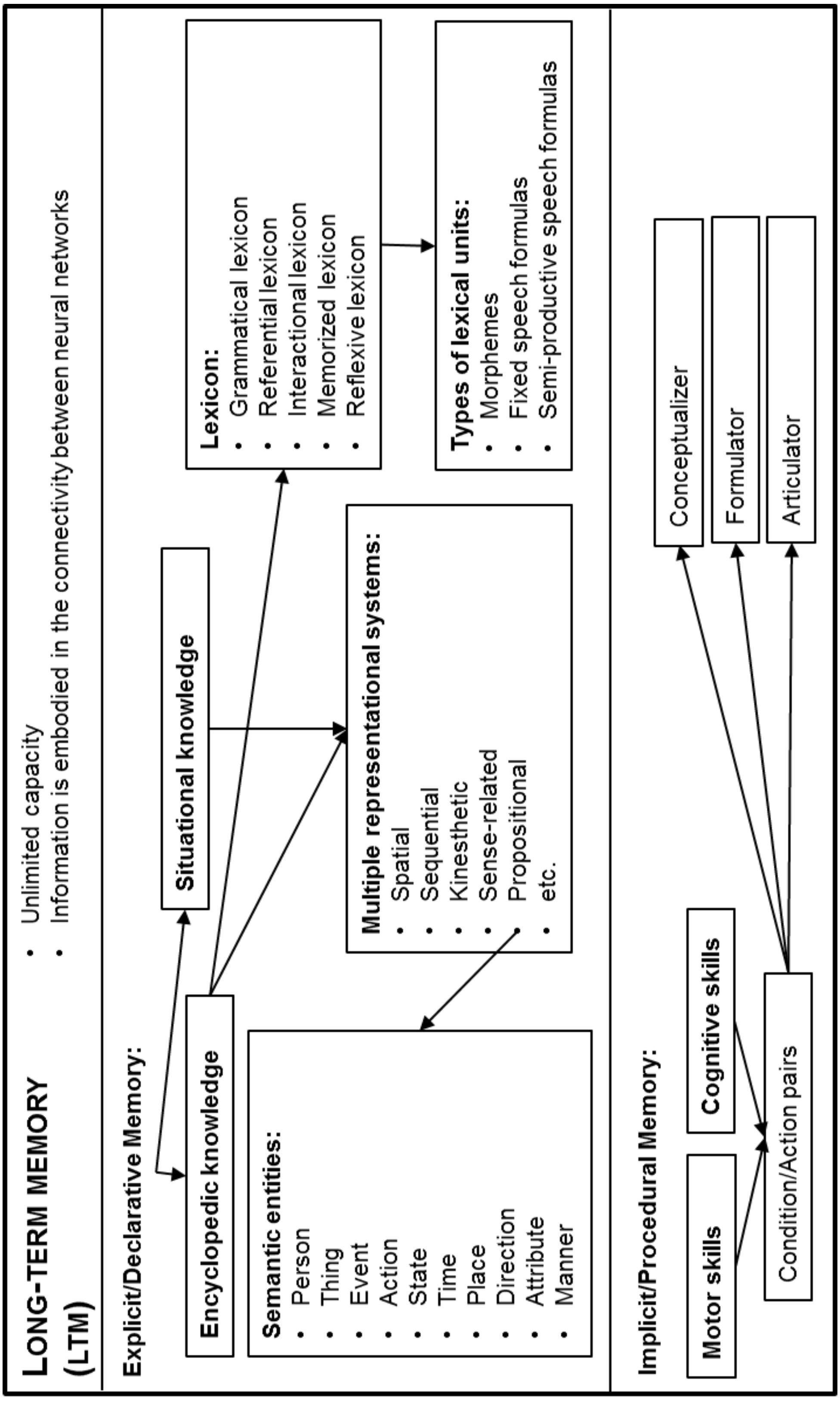


Figure 22 Long-term memory in a language-oriented memory model

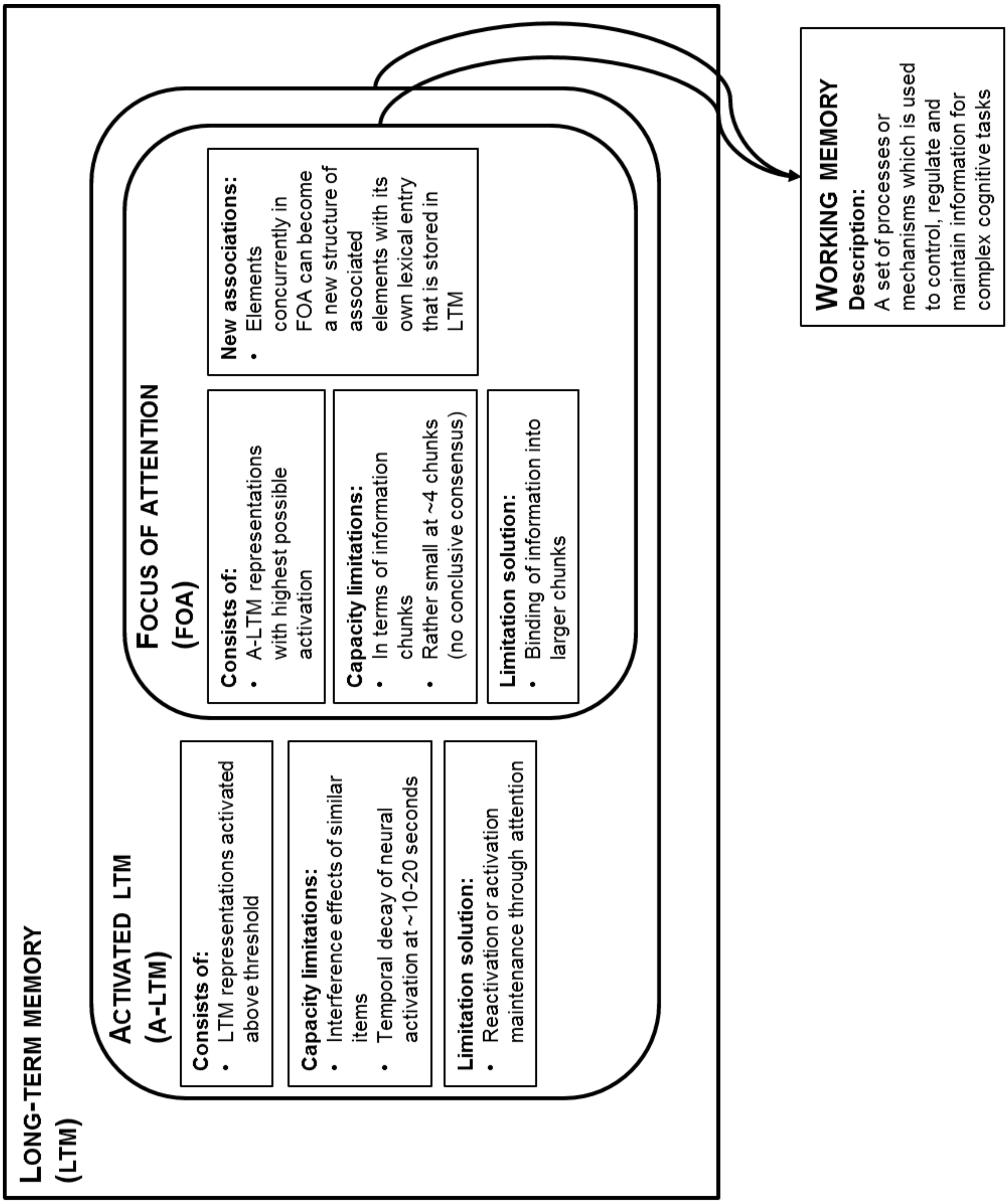


Figure 23 Working memory in a language-oriented memory model

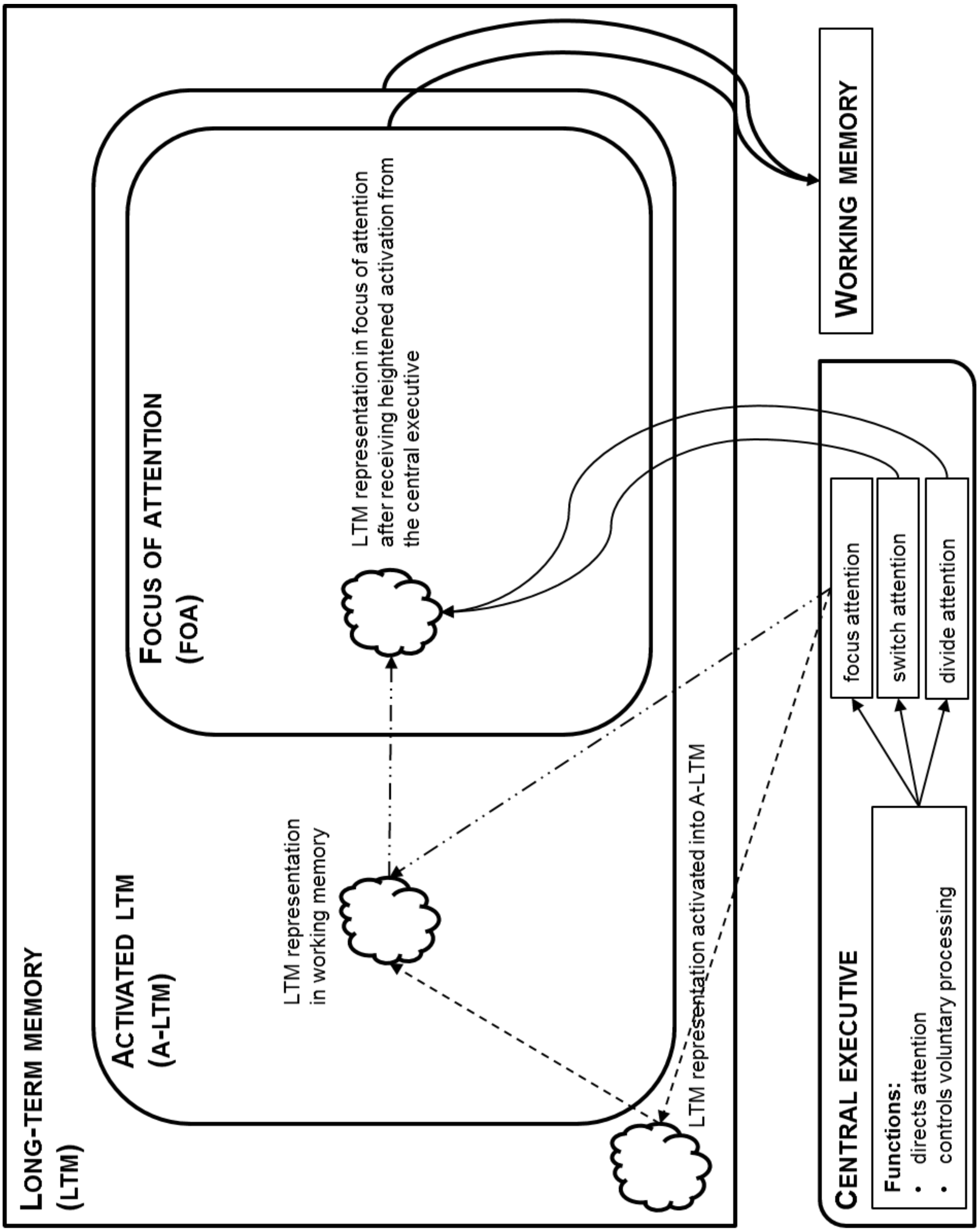


Figure 24 The central executive in a language-oriented memory model

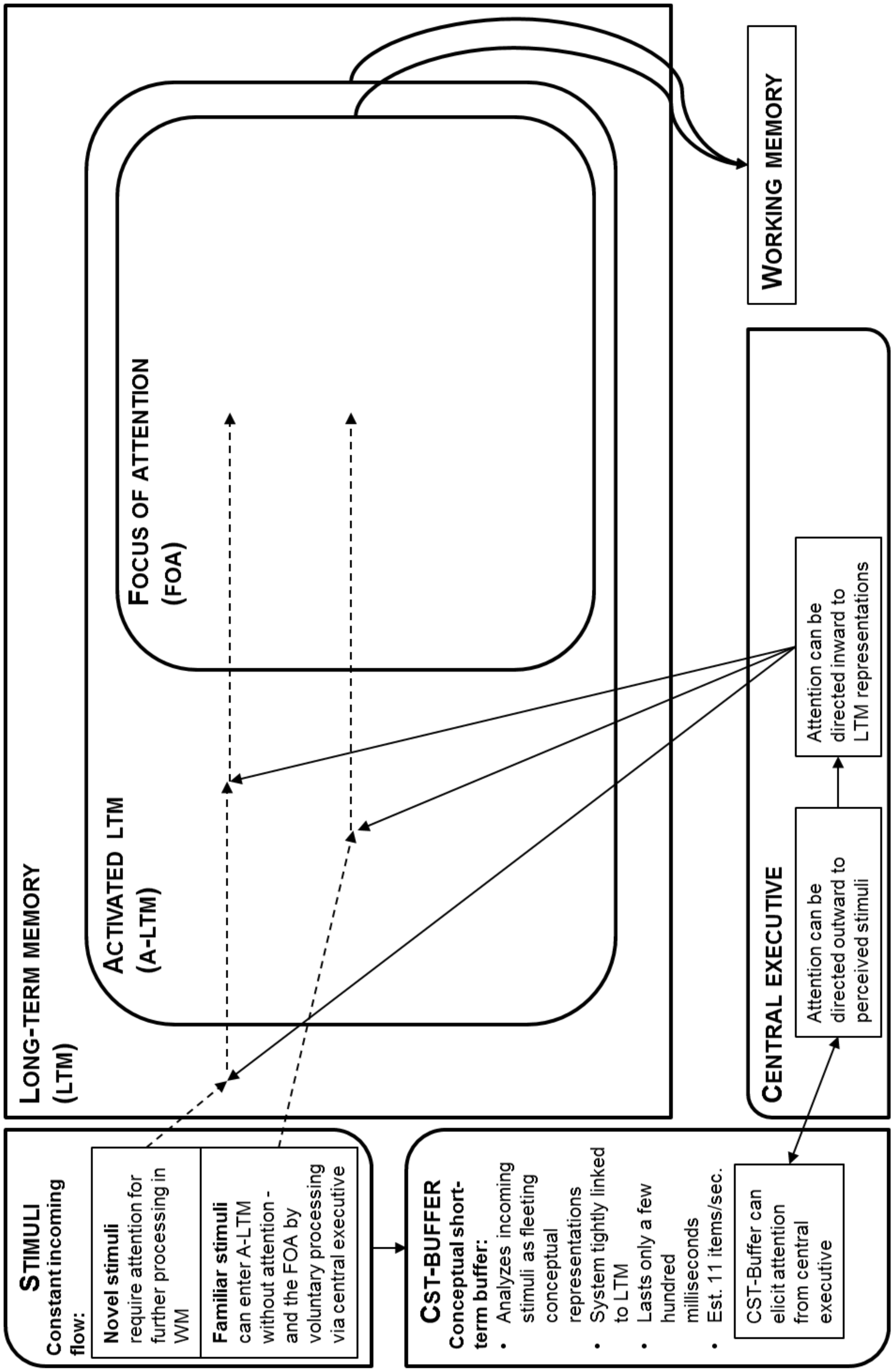


Figure 25 Stimulus perception in a language-oriented memory model

7 SPEECH PRODUCTION UNDER INCREASED COGNITIVE LOAD

7.1 Elements of language production requiring working memory resources

Having laid out the physiological aspects of a potential working memory overload in the previous chapters, the focus now turns specifically to linguistic elements of language production that are believed to demand working memory resources. The goal is to pinpoint at this stage already the areas of language production, from perceiving visual stimuli to their articulation, where pre-fabricated speech formulas eventually could reduce working memory burden effectively.

In order to group the investigated elements meaningfully, a division of language production by Levelt (1989:9) will be adopted. The various processes involved are divided into three main components, each working on an input/output mode, that is, receiving a form of input and producing a form of output that may serve as input for another component.

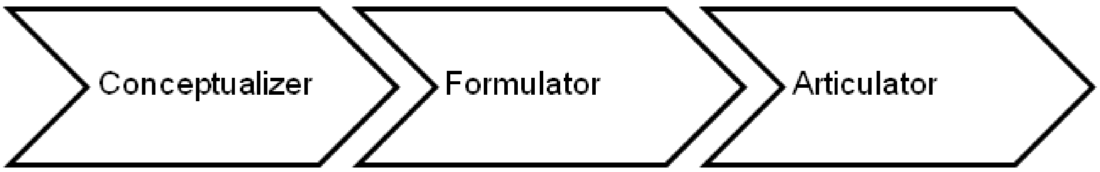


Figure 26 Three autonomous process components of language production (Levelt 1989)

The corresponding functions are briefly described and explained by Carletta et al. (1995:358) as well as Habel and Tappe (1999:122). In the CONCEPTUALIZER the speaker decides what message he or she wants to convey to a recipient and generates conceptual structures in a propositional form. Multimodal representations are formed into a non-linguistic preverbal message and relayed to the formulator. In the FORMULATOR the proper lexical items and grammatical structures for the intended message are selected. These language-specific coding processes result in a string of commands for the articulator. In the ARTICULATOR, these motor commands are phonologically processed and ultimately realized as an acoustic utterance. Levelt's components of language production portrayed in Figure 26 can therefore be slightly refined to illustrate the respective inputs and outputs of each component.

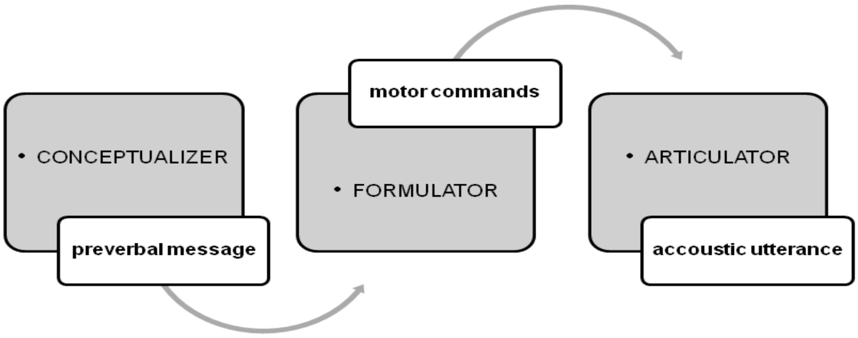


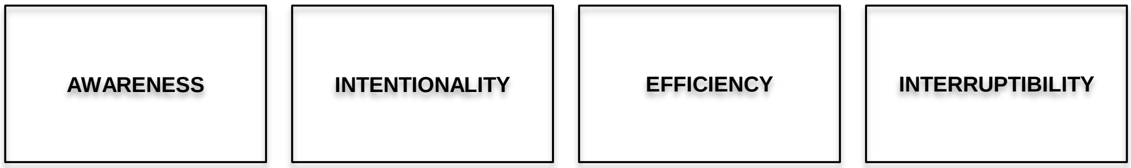
Figure 27 Inputs and outputs of Levelt's components

7.2 The pillars of automaticity

Good indicators of how much certain processes rely on working memory's shared pool of resources are studies of automaticity and control. Garrod and Pickering (2007) elaborated on Bargh's (1994) "four horseman of automaticity" – four aspects that help in the classification of a process on the scale from automatic to controlled. Garrod and Pickering (2007:2) point out that in traditional cognitive psychology the question of automaticity and control was handled in an all-or-none fashion: "Automatic processes were considered to be involuntary, not drawing on general resources, and resistant to interference from attended activities or other automated activities", whereas controlled processes were believed to be just the converse.

More recently, a newer approach presented by Garrod and Pickering (2007:3) challenges this all-or-none approach, although it maintains much of the characteristic nature of automaticity and control. It is now widely believed that the various processes in Levelt's components (see Figure 27) function on different degrees of automaticity. Instead of an automatic process, which implies full automaticity, the newer concept terms it a "strong process", which tends to be more resistant to interference and therefore more efficient, but does not need to be entirely without voluntary control. On the contrary, a "weak process" is likely a controlled one that is more susceptible to interference. While embracing the approach of graded automaticity and control and acknowledging the fact that some processes are stronger than others, the current research will continue to use the terms automatic and controlled in order to qualify individual processes in terms of their demand on working memory resources.

The four pillars of automaticity according to Bargh (1994) are in summary: awareness, intentionality, efficiency and interruptibility. Specific characteristics for the qualification of a process are given below.



The first argument is that the less aware a speaker is of a certain process, the more likely it is automatic. Automatic processes would then as a consequence save attentional resources from working memory's focus of attention. Intentionality serves as another criterion. If a speaker needs to actively and voluntarily initiate a certain process, it is considered less automatic. Certain speech errors for example can thereby be described as automatic, because they occur without a speaker's volition. Some of the advantages of automatic processes clearly lie in their efficiency in comparison to their controlled counterparts. Garrod and Pickering (2007:3) argue that since automatic processes function without awareness and intentionality of the speaker, and in addition spare the focus of attention to a large extent, they are faster and stronger as a whole and therefore more efficient. The last pillar of automaticity is the interruptibility of a process. A speaker cannot easily stop or change an ongoing automatic process once it has started. Weaker processes that are controlled, however, can be subject to modification for example, while the process is underway.

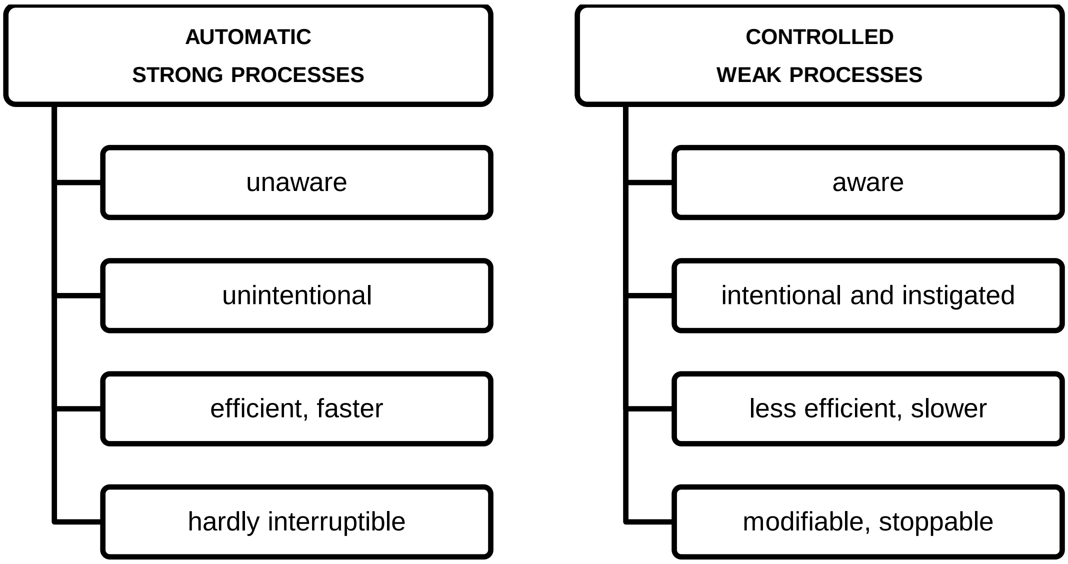


Figure 28 The characteristics of automatic versus controlled processes

While some of the characteristics in Figure 28 may apply altogether to a certain process, there are other processes that might be qualifiable only by some of the introduced pillars of automaticity - and yet others might show certain automatic nature with respect to some aspects and at the same time a controlled nature with respect to other aspects. One should be reminded of the graded notions of automaticity and control.

Levelt (1989) suggests a strict hierarchy of his three components with respect to automaticity and control. Before we turn to each component in the upcoming sections and look at specific linguistic processes Figure 29 illustrates Levelt's assumption:

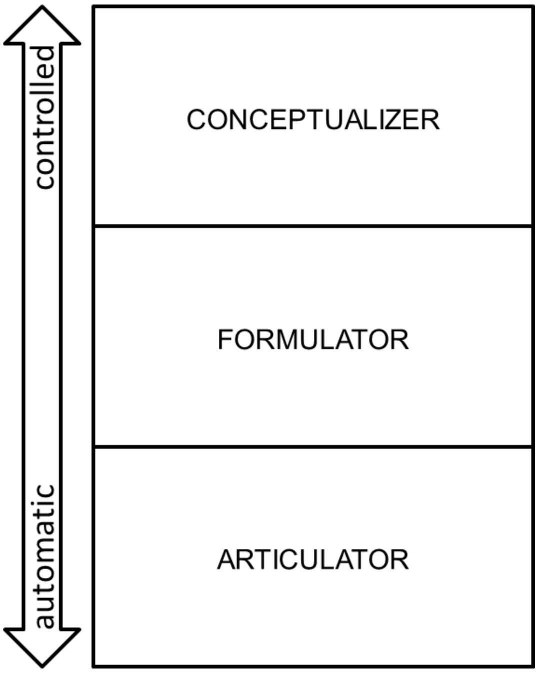


Figure 29 Degree of automaticity and control in language production

7.2.1 Elements within the CONCEPTUALIZER

The task of the conceptualizer is to build meaningful units and event structures from a stream of unstructured and successive stimuli perceived by the various sensory systems. It consists of five main processes, according to Habel and Tappe (1999:122). The first two can be combined to a pair: SEGMENTATION and STRUCTURING. During segmentation a speaker decides which perceived stimuli are relevant for a current conceptualization. They can be of all sorts and from several sensory systems (e.g. visual, haptic, motor, olfactory, etc.). Entities can be segmented spatially or temporally before they are structured. During the structuring process, a hierarchical structure of events is built (see Figure 7 for examples of event structures).

Segmentation and structuring are part of what Levelt (1989:5) refers to as MACROPLANNING, where the speaker elaborates on the communicative intention of the message. There is no doubt that both processes are very much controlled, as each speaker is relatively free to decide which stimuli might be relevant for the intended message. The only apparent constraint is the communicational goal that sets up a framework of relevancy, especially when considering the data corpus of the current research. Nevertheless, there is never just one single way of achieving this intended goal.

In this macroplanning stage of language production the speaker must be familiar with the discourse model in which his utterance will be realized. Defined by the communicational goal for the utterance the speaker, with prior knowledge about the discourse situation, segments and structures the multimodal input for a preverbal message.

The next pair within the conceptualizer are the SELECTION and LINEARIZATION processes, which are already considered part of MICROPLANNING. During selection, particular objects and entities are chosen for verbalization. A contact with the semantic and conceptual lexicon takes place at this stage and abstract thoughts and events take a more concrete form. Linearization of the selected items in the next step refers to the arrangement of the elements for the intentioned message into a propositional format. According to Levelt (1989:73), every finished preverbal message as final product of the conceptualizer needs to be in a propositional form, regardless of whether the elements it is built from are of different representational systems.

As the fifth process within the conceptualizer, PERSPECTIVATION finalizes the preverbal message. It is the most studied process of Levelt's first component, according to Habel and Tappe (1999:123), building an interface between the conceptualizer and the following formulator component. It is a sort of microlinearization that gives the message a more refined structure. Habel and Tappe disagree with Levelt on whether the processes of the conceptualizer are at least partly language-specific or purely preverbal phenomena. If we look at some factors that determine the final structure of a message, we discover that the march of thoughts and some principles might only hold for certain languages, and agree with Habel and Tappe who suggest that only segmentation and structuring may be purely language universal. Dietrich (1999:64) presents a number of such principles that influence the linear precedence of information in language production: topic, focus, givenness, agentivity and definiteness are some of the factors mentioned. Topic information, for example, generally precedes focus information, maintained information precedes re-established and new information, agents come before non-agents and deictic references have priority before anaphoric and indefinite references. Many of these (presumably not language-universal) principles are applied during the linearization and perspectivation processes, just before the formulator takes over as next component. In summary, during the processes of the conceptualizer we can observe a shift from an unstructured stream of perceived stimuli to a series of propositional, linear fragments that incrementally are relayed to the formulator.

With respect to automaticity and the criteria introduced in section 7.2, it is argued that the further down in the line of the processes – and the hierarchy is predetermined – the more room for automaticity exists. Whereas segmentation and structuring require a large amount of attentional resources, some aspects of selection can clearly be primed by the initially set communicational goal, and therefore less awareness may be required. Linearization into a propositional format also leaves only a limited choice and can partly be automatized once the previous three processes have been concluded. In summary, the further we go down the line of processing within the conceptualizer, the more of the preverbal message gets defined, narrowing the options for the speaker and requiring less working memory resources. For Habel and Tappe (1999:150) it is clear that segmentation and structuring pose the main burden on working memory in conceptualizing propositional messages of events. Supporting this assessment is Rummer (1999:47) who also claims that language production is effortful especially at the macroplanning level. As for the conceptualizer as a whole, Levelt (1989:21) suggests that it is the only truly controlled component in language production.

7.2.2 Elements within the FORMULATOR

In contrast to the conceptualizer, Levelt (1989:21) believes that there is less executive control over the processes within the formulator component. The formulator contains three distinctive processes, which will be introduced in hierarchical order according to their degree of automaticity.

The most controlled process in Garrod and Pickering (2007:6) is the CHOICE OF LEXICAL ITEMS for the "blueprint" of the preverbal message. This process cannot be automatic, because the speaker is usually confronted with a larger choice of lexical specification. With respect to the pillars of automaticity, one can argue that speakers can be aware of their lexical choice at any level of message formulation, even after uttering a word. Furthermore, Garrod and Pickering argue that except for particular function words (e.g. *that),* which are selected on the basis of compatibility with other words and do not require a concept of their own, "lexical access must surely be intentional: it is hard to see how it could take place without voluntary instigation of the process". Another criterion placing the choice of lexical items on top of the working memory resource demanding hierarchy of the formulator is the fact that it is not always efficient in the sense that a general working memory load can impair lexical access and result in speech-errors like tip-of-the-tongue phenomena. Finally, a speaker can abandon a lexical choice, change it, repair and modify it, which shows the potential interruptibility of the process, lending it a more controlled than automatic status on all four pillars of automaticity introduced.

After the lexical choice the formulator begins the GRAMMATICAL ENCODING. Garrod and Pickering (2007:7) explain why it is difficult to clearly qualify grammatical in terms of automaticity and control. On the one hand, especially advanced speakers of a language may be aware of some of their grammatical choices, such as the use of a passive construction in a sentence, whereas less professional speakers might use them without realizing the differences. On the other hand, speakers of all levels are certainly not aware all choices they make, leading to the assumption that with respect to automaticity, awareness of the output of grammatical encoding is more likely than awareness of the process itself, resulting in a mix of automaticity and control. A similar point can be made for intentionality. Sticking with the example of a passive construction, some concepts including an agent and patient (e.g. *A* being chased and fleeing from *B*) can favor passive constructions automatically over an active construction. In how far such a passive encoding is intentional or almost predetermined and automatic is difficult to judge.

Grammatically more complex utterances are more difficult to produce and there is generally more disruption with complex grammatical encoding. Therefore, grammatical encoding must involve some mental effort and rely on working memory resources. This interruptibility also makes it less efficient in comparison to fully automatic processes. In summary, grammatical encoding shows some features that can be classified as partly automatic, but the fact that at this level there is still considerable choice of alternatives dictates that, in contrast to Levelt's claim, at least in part it must be a controlled process to which central attention must have access.

As next step in the formulator, Garrod and Pickering (2007:8) identified PHONOLOGICAL ENCODING. Also this process seems to alternate between automatic and controlled sub-processes. Intonation and stress, for example are believed to be rather controlled, as they can play a fairly big role in meaning differences under some circumstances. Speakers often intentionally stress particular words and are aware of the implications, suggesting more control than automaticity according to the introduced criteria. Intonation in questions during a spoken conversation is believed to similarly follow the same line of argument.

There are nevertheless some sub-processes of phonological encoding that Garrod and Pickering (2007:8) identify as automatic and not competing for working memory resources. They argue that since there is usually no choice in phonological form, selecting syllables and phonemes for words are automatized.

7.2.3 Elements within the ARTICULATOR

Levelt's last component in language production is the articulator. Many aspects of articulation seem automatic, as it is essentially not a further elaboration of the message, but an execution of motor commands. However, speakers still have some choice and control. They can for example choose to intentionally speak with a certain accent. Again, a mixture of automaticity and control exists, which is best summarized by Garrod and Pickering (2007:8): "In general, aspects of articulation that relate to a whole expression or utterance […] are less likely to be automatic than aspects that relate to a smaller fragment such as a phone". The above mentioned intentional accent, for example, is a choice that affects an utterance as a whole. Further examples are the speed of speech or the use of a sarcastic voice, all of which are believed to be controlled (or at least controllable) to a high degree. In contrast, the execution of a motor command for a single phone or syllable is believed to be automatic, because the speaker is not aware of this hardly interruptible process.

Having discussed and qualified each component of language production and some of their processes in terms of automaticity and control according to the four pillars of automaticity introduced in section 7.2, the proposed hierarchy by Levelt portrayed in Figure 29 can now be modified as follows:

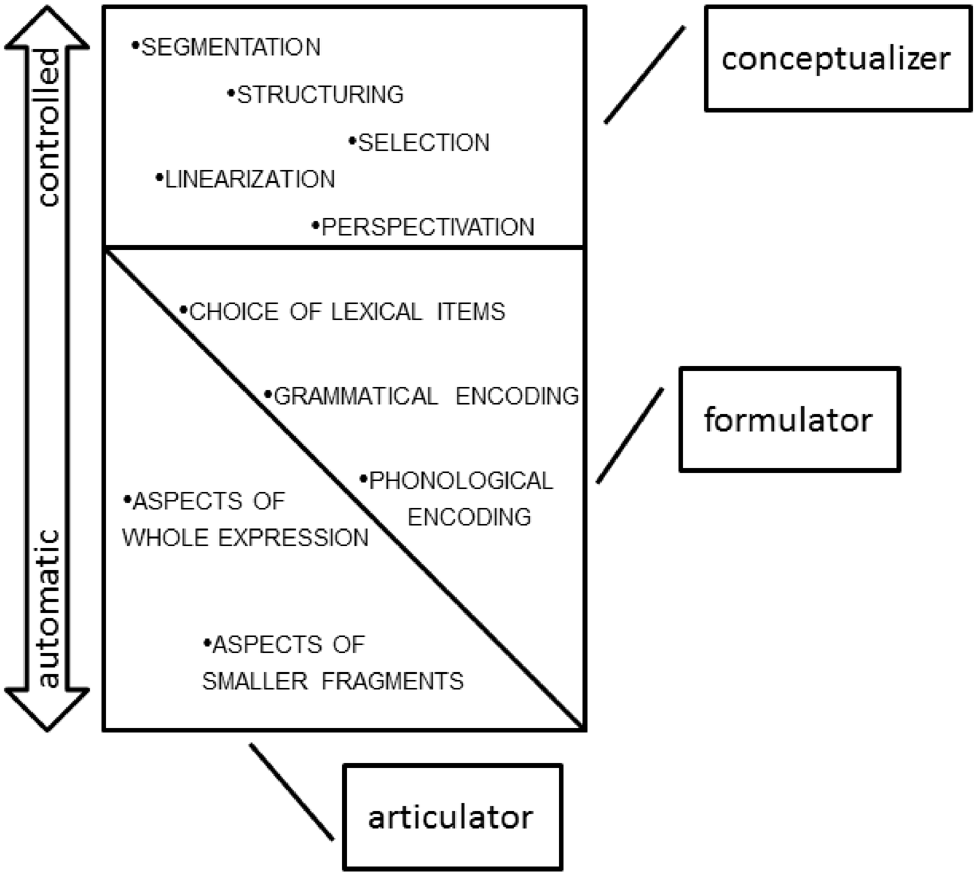


Figure 30 Modified hierarchy of Levelt's components of language production

While the positions of Rummer (1999:47) and Levelt (1989:21) appear to hold, namely that the conceptualizer is the most controlled and hierarchically highest of the three components of language production, the hierarchy as a whole by Levelt might be a slight simplification of the true state of affairs. Unfortunately, there is no tool to measure automaticity that would allow a universally valid and detailed graphic placement of the processes. Furthermore, Figure 30 displays only the processes that were investigated in the current chapter, and covers by no means all elements (i.e. sub-processes) of language production.

The modification undertaken, however, is intended to reflect the mixed degrees of automaticity and control in the formulator and articulator. There is no reason to simply assume that all elements within the formulator are more controlled than the elements within the articulator. As we have seen with the articulation of phones and syllables, they could be on the same level of automaticity as their selection during phonological encoding. While maintaining the general hierarchy of Levelt's three components due to the incrementality of the processes involved, Figure 30 places the formulator and the articulator in a way that reflects at least the possibility for elements to be of the same degree of automaticity or control.

The elements of language production that require most working memory resources, and are therefore good candidates for formulaic language to take over in order to ease or avoid a working memory overload, were identified according to Levelt's three components (conceptualizer, formulator and articulator). Criteria of awareness, intentionality, efficiency and interruptibility were applied to place the major processes of language production into a hierarchy according to their degree of automaticity. While the conceptualizer appears to be almost fully controlled, some processes of the formulator and articulator clearly allow for automated speech.

7.3 Indicators of increased cognitive load in speech production

After the layout in particular of the core processes from conceptual preparation to articulation in subchapter 3.3, the elements of language production requiring working memory resources in 7.1, and the capacity limitations of working memory and its sub-components in 4.4, the next step is now to look at specific symptoms of speech production under increased cognitive load. Such symptoms are candidates for the corpus analysis of the sports commentary data that are tested as variables and compared between the play-by-play parts of the data (visual-event verbalizations under time pressure) and the color-commentary parts of the data (event-related but free speech) in order to corroborate evidence for the hypothesis that recurring events in visual event narration routines create an environment where semi-productive speech formulas can be applied to a high degree to ease the overall burden on working memory load - within the conceptualizer, the formulator and articulator components of language production.

The search for good indicator candidates that have proven suitable in previous studies was a difficult one, because the possible symptoms one could analyze seemed almost infinite and admittedly included some that for the current research are impossible to replicate due to the lack of the appropriate technical equipment. One example would be the measurement of prosodic and acoustic speech features by Lively et al. (1993) as well as Yin et al. (2007). However, a closer look at the latter work directed attention to an entirely specialized field of research dedicated to speech features under high cognitive load in artificial intelligence. While generating similar descriptive results it aimed at producing a computed tool that can automatically detect a user's cognitive load on the basis the elaborated speech features.

Studies, such as Berthold and Jameson (1999) dedicated to the applicability of speech symptoms for the detection of cognitive load developed their own chart of symptoms based on a comparison of existing literature, which for the current research helps to better select those candidates that have shown similar behavior in many previous independent studies by a variety of authors, ensuring a solid foundation for their inclusion in the sports commentary data analysis. Furthermore, consecutive modeling attempts (e.g. Jameson et al. 2010) implementing symptoms of this collection have achieved a high accuracy in automatically detecting and determining the degree of cognitive load in experimental settings. The fact that this reversion approach, the successful implementation of descriptively collected speech symptoms into Bayesian networks as condition parameters for artificial intelligence software, produced relatively reliable detection accuracy affirms the validity of the selected symptoms.

A qualification of the speech symptoms that come into consideration for the analysis of the sports commentary data is made in three categories: pausing, output quality, and output rate. These three categories, the speech symptoms allocated to them, as well as their "behavioral tendency" under increased cognitive load will be described in more detail in the following sections based on the results of previous studies and existing literature.

7.3.1 Pausing

Pauses in speech production can have an impact on both output quality and output rate and were therefore treated separately in a category of their own. Rummer (1996:50) points out that in extreme case of working memory overload the entire processes of speech production could come to a halt, which would manifest itself in a speech pause. Nevertheless, there can also be communicative reasons behind pausing that have to be considered. We must therefore distinguish between cognitive and communicative pauses. While it is impossible to classify each pause according to the suggested dichotomy, the distinction between filled pauses and silent pauses helps at least in part. The so-called FILLED PAUSES, with filler sounds (e.g. *er, uhm*) that are retrieved from the lexicon and uttered unconsciously and automatically, are considered symptoms of cognitive overload. SILENT PAUSES of various lengths, ranging from a few tenths of a second to several seconds are more difficult to classify. However, it appears that a short or medium pause of only a few tenths of a second up to about half a second is more likely to occur as a result of high cognitive load than as communicative tool, because it will be perceived as a break in speech rhythm rather than a turn-taking signal that would allow another speaker to take the floor.

The general tendency in previous studies collected by Berthold and Jameson (1999) and refined by Jameson et al. (2010) showed an increase of the number as well as the duration of silent pauses under higher cognitive load. Four out of five studies, among them Rummer (1996), produced evidence for more silent pauses while eight out of ten studies attested a longer duration of the average pause under working memory load conditions. With such a clear trend found in previous studies both silent pause frequency and duration are considered suitable candidates for the data analysis of sports commentary.

Less clear agreement in the literature was found for filled pauses, especially in terms of the duration of the applied fillers. One study reported a significant increase whereas another could not support the same finding. With respect to the actual count of filled pauses, however, the majority of the six analyzed studies discovered a tendency towards an increase under higher cognitive load. Therefore, the analysis of the sports commentary will focus only on the number of filled pauses in play-by-play commentary compared to color-commentary.

Due to the unclear evidence for filled pause durations there will be three variables only measured in the data that belong to the category pausing: number of silent pauses, duration of silent pauses, and number of filled pauses. As previously pointed out, they are treated separately from output quality and output rate variables, even though they have a clear influence on both categories (e.g. pause duration on output rate).

7.3.2 Output quality

A large number of speech features that have been analyzed in the context of increased cognitive load are affecting the fluency of the utterances and as a consequence the quality of the speech and are therefore subsumed here in the category of speech output quality.

According to Jameson's (2010) survey REPETITIONS, where a word or a whole sequence of words are repeated (as in *turn *turn right here*) are a clear indicator of increased cognitive load of a speaker, with five out of six studies (e.g. Deese 1980) supporting this tendency with their results.

Another feature occurring more frequently in association with a higher demand on working memory resources are FALSE STARTS or DELETIONS where a speaker begins with an utterance, suddenly interrupts it and then restarts again on a new sentence (as in *I don't *do you see over there*). Under increased working memory load the frequency of false starts and deletions is higher than during a low demand situation, as was shown in Rossnagel (1995) for example.

Even though the literature reviewed (e.g. Oviatt 1995) gave controversial results about the relationship between cognitive load and the occurrence of SELF-CORRECTIONS, with two studies finding an increased frequency under higher working memory load, four reporting no change in either experimental situation, and one experiment producing even evidence that self-corrections are less common when the general demand on working memory resources is larger, the feature is included in the data analysis as a candidate. The reasoning behind the inclusion of this variable despite its little value towards collecting evidence for the working hypothesis is the hope to get additional information on speech disfluency features from the data.

A fourth category of disfluency phenomena includes all kinds of ARTICULATION ERRORS where whole words are repeated and corrected due to a mispronounced phoneme (e.g. *go lift *left* here), SLIPS OF THE TONGUE in which a phoneme is pronounced wrongly at first and the word abandoned (e.g. *a great tex- *technique*), or STUTTERINGS where a phoneme, although a correct one, is repeated once or more often before the entire word is uttered (e.g. *d- d- *did you see*). According to Kemper et al. (2011) speech production is especially vulnerable to such fluency breakdowns during a period of high demand on the limited resources of working memory. A higher frequency of articulation errors, slips of the tongue and stutterings, as selected examples of disfluency phenomena is therefore the consequence of an increased cognitive load.

7.3.3 Output rate

As previously mentioned, the play-by-play narration part of sports commentary is perceived by an audience as high-paced, fast speech. It is therefore interesting to find a broad consensus in the literature that under higher cognitive load both the speech rate and the articulation rate decrease. All seven studies reviewed by Berthold and Jameson (1999) have shown a slower overall SPEECH RATE, which is defined by the ratio of production units per time unit. Speech rate includes the duration of silent pauses during an utterance, excludes the onset time of a speaker's turn and is most often presented as "words per second" or "syllables per second". In summary, speech rate is the ratio referring to the total time a speaker is holding the floor.

An equally clear trend was found for the actual ARTICULATION RATE, which is defined by the ratio of production units per time unit without the total duration of the silent pauses within the utterances. This measure reveals how quickly words or syllables are pronounced independent from pausing that may be also be tied to reasons other than cognitive load. In Jameson et al. (2010) the articulation rate was found to decrease during higher cognitive load in all seven studies reviewed, and is also typically reported in "words per second" for larger data or "syllables per second". In summary, articulation rate is the ratio referring to the actual total speaking time.

7.3.4 Behavioral tendencies of indicators of increased cognitive load

The indicators of increased cognitive load in speech production are summarized in Table 6 to serve as basis for the data analysis in chapter 9 where a statistical analysis of the six symptoms selected is expected to produce evidence for the research hypothesis. Some literature sources are indicated to show which previous studies have worked with the identical indicators in the detection of cognitive load in speech output, among them the review by Berthold and Jameson (1999), which itself is based on a collection of several studies by different authors.

Indicator (Symptom)	*Tendency*	*Sources*
pausing: silent pauses frequency	increase ↑	Jameson et al. (2010), Khawaja et al. (2007), Müller et al. (2001), Berthold and Jameson collection (1999)
pausing: silent pauses duration	increase ↑	Jameson et al. (2010), Khawaja et al. (2007), Berthold and Jameson collection (1999)
pausing: filled paused frequency	increase ↑	Jameson et al. (2010), Khawaja et al. (2007), Müller et al. (2001), Berthold and Jameson collection (1999)
Output quality: Disfluencies	increase ↑	Kemper et al. (2011), Jameson et al. (2010), Müller et al. (2001), Berthold and Jameson collection (1999)
Output rate: Speech rate	decrease ↓	Jameson et al. (2010), Müller et al. (2001), Berthold and Jameson collection (1999)
Output rate: Articulation rate	decrease ↓	Jameson et al. (2010), Müller et al. (2001), Berthold and Jameson collection (1999)

Table 6 Behavioral tendencies of indicators of increased cognitive load

The task of the sports commentary transcript analysis in chapter 9 is to work out the behaviors of these indicators in play-by-play commentary and color-commentary as comparative data, in order to allow for conclusions regarding the claim that overall the visual event narration part of the data, despite its dual task, requires less working memory resources due to the formulaic language applied.

8 PINNING DOWN SEMI-PRODUCTIVE SPEECH FORMULAS

"It is something of a joke amongst those who write for a living that it is possible to construct plausible text out of prefabricated chunks."
Wray (2002:5)

In order to explain in more detail how the setting of play-by-play commentary enables language automation on possibly all three components of speech production to prevent working memory overload, some knowledge about the prerequisites for semi-productive speech formulas in sports commentary is necessary. Kuiper and Austin (1990:198) reiterate the claim already made in Kuiper and Haggo (1985:168) that:

"Play-by-play commentary is oral formulaic. Colour commentary is not."

Although powerful, this may be a somewhat simplified truth and requires more clarification. By "oral formulaic" the authors refer to the use of speech formulas as a performance technique they have encountered in many speech situations where speakers are under a high working memory load and/or time pressure, which both applies to play-by-play commentary. Kuiper and Austin (1990:198) admit that color-commentary, which is used between the visual event narrations of play-by-play, does use speech formulas, but at a very low concentration. In fact, it is very likely that color-commentary makes use of fixed speech formulas, such as the ones introduced in 2.4.1, but the point is that only the environment of play-by-play commentary is suitable for a predominantly formulaic speech production and semi-productive speech formulas that are beneficial in terms of working memory resources.

On the one hand, due to the working memory constraints of the human brain, called the INTERNAL CONSTRAINTS by Kuiper (2000:280), efficient and successful speech production must resort to or favor long-term memory solutions in situations where a speaker is under increased cognitive load from multiple tasks. These long-term memory solutions, on the other hand, are inextricably intertwined with routine context, as EXTERNAL CONSTRAINTS.

Kuiper (2004:39) points out that generally for formulaic performance the rule applies that it is only possible in routine contexts where "there is an expectation that things will happen in much the same way that they have happened before. The resources of a formulaic tradition can only operate appropriately in such a context". The nature of how pre-fabricated speech formulas are learned and memorized dictates that the events they are indexed for have to recur frequently enough to establish such a formula in long-term memory. As a consequence, a high density of semi-productive speech formulas is possible where there cannot be a high degree of novelty to narrate, which is only given in play-by-play commentary.

In Kuiper and Haggo's (1985) analysis of ice-hockey play-by-play commentaries, the authors state that "only certain episodes that are significant are verbally coded. There are no formulae for some of the reasonably independent episodes in the actual visual structure." In that sense, play-by-play commentary is designed to verbalize only a limited number of possible routine events that themselves only have a limited number of potential outcomes. In terms of Wray's (2002) model of speech formulas in the interests of a speaker this means that whenever a non-routine event (or an endo-evoked verbalization of an idea) that occurs during a sports event requires a novel utterance, the free and less activity-tied type of color-commentary can be applied - although at a certain processing cost. The level of effort for that is relatively high because it does not reduce any processing load (see upper pathway in Figure 4).

In order to locate these routine events that build the environment for speech formulas in the data the corpus has to be split up between those parts that are play-by-play and others that are color-commentary. The next chapter undertakes this partitioning by coding utterance fragments in the data that refer to actions on the basketball court that the speakers must have perceived visually and which are part of the main task of sports commentary.

8.1 Routine events for play-by-play commentary

In a first step the footage of the basketball games that served as source for the transcripts in chapter 10 has been reviewed to code all utterances within the transcribed parts of each game that could clearly be identified as a vision-to-word transformation, that is, verbalizations that match actions on the basketball court that could only be perceived visually. Those typical play-by-play narration elements in most cases focus on what is happening around the basketball, as pointed out in more detail section 10.1.2. With the help of the MAXQDA10 coding software an initial run has resulted in a total count of 429 visual event codes that where consequently compared and grouped into thematic categories of routine events.

code in MAXQDA10	*thematic category assigned*	*count*
A	a foul / foul call	40
B	shooting / scoring attempt	47
C	success	30
D	failure	37
E	movement of a player	56
F	movement of the ball (pass)	42
G	ball possession	56
H	position / location on court	26

I	player action (general)	76
J	constellation / tactics on court	10
K, L,?	time / score / other	9

Table 7 Code system: visual event codes and their thematic categories

The frequency and dominance of some codes over others appear to be in accordance with the purpose of sports commentary described in 10.1.1, as the four most often occurring ones - the "most routinized routines" - are general player actions, ball possession, movements of a player and scoring attempts by shooting the ball towards the basket. Less frequent thematic categories seem to be more additions to the central event narrations. The last listed category includes three codes building a rest group, with code L covering accounts of the match score and code K match time that were linked to direct visual events instead of, which is normally the case, statistics provided in stadium or from the television network that would be attributed to color-commentary (and verbal input). The remaining utterances that could not be grouped into an obvious thematic category build the code ? rest. For each visual event code category introduced some samples from the transcripts are selected to demonstrate in Table 8 how they look like in the actual data. The transcript numbers and time code (the RT column in the data transcripts) are given source column, so that if one desires more contexts around the samples can be found.

Code	*Sample*	*Source*
A	*OFFENSIVE foul called on .. Shareef Abdur Rahim*	*13.3/0:42:52*
	Jerome James is fouled by Shaquille O'Neal	*13.4/0:18*
B	*Mike Dunleavy makes an eighteen footer*	*13.2/1:34:32*
	THROWS down the lob	*13.2/1:45:00*
C	*he SCORES*	*13.3/0:48:34*
	a THREE POINTER for Okur	*13.7/1:17:46*
D	*comes way short*	*13.2/1:43:04*
	off the TOP of the BOARD	*13.2/1:46:23*
E	*all the way to the basket*	*13.2/1:39:54*
	Kenny Anderson comes into the front court	*13.4/0:18*
F	*they drop it down low to Abdur Rahim*	*13.3/0:41:03*
	Damon tips the rebound to Abdur RAHIM	*13.3/0:41:24*
G	*Dunleavy with it*	*13.2/1:36:11*
	Kobe Bryant	*13.6/2:36*
H	*Shaq out on the perimeter*	*13.2/1:36:49*

	HE'S outta bounds	*13.2/1:43:48*
I	*FALL away jumper* *preventing the THREE*	*13.2/1:37:30* *13.5/2:22:44*
J	*here is PAYTON against Miles* *Medvedenko back in the GAME*	*13.5/0:49:48* *13.7/1:08:24*
K, L, ?	*four on the SHOT clock* *seven assists for Shaquille O'Neal* *the Lakers fall asleep on the free throw*	*13.7/1:17:18* *13.4/5:00* *13.2/1:39:22*

Table 8 Code system: data samples for each visual event code category

While some of the transcript samples are straightforward propositions that can easily be understood by anyone, such as *Kenny Anderson comes into the front court*, others are difficult for an audience that is not familiar with the field-specific language. Some particularities of sports commentary for example include the reduction in narrating ball possession. Since the focus is so heavily on what is happening to the ball, often naming a player as in *Kobe Bryant* of the code G sample automatically refers to ball possession by this person. The character of the verbalizations of these routines sometimes reminds one of picture captions that are concise and to the point instead of long poetic descriptions.

It is important to remember that the categories introduced above were not pre-defined but designed after the coding of the vision-to-word elements in the transcripts to group similar play-by-play themes for a better overview, rather than for statistical analysis. Despite the fact that the categories as such were loosely defined, a code-relations analysis of all visual event codes reveals that some themes co-occur more likely in certain combinations.
Figure 31 below presents these findings from MAXQDA10 with a dot-matrix where co-occurrences are displayed within one speaker turn.

Figure 31 Code-relations: visual event codes

Co-occurring themes of visual event narrations (larger dots indicating a higher / smaller dots indicating lower co-occurrence within the same speaker turn

The most frequent visual event of a general player action (code I) that does not cover actions already represented by other codes, such as making a foul on an opponent, appears to be mentioned frequently together with ball possession (code G), movements of a player (code E) or situations where a ball is shot or at least a shot attempted (code B). We can therefore assume that a play-by-play commentator, although unconsciously, makes use of this routine when conceptualizing a complex event by breaking it down into such smaller sub-events that cover only one theme.

Central to a formulaic tradition, such as sports commentary, are so-called discourse structure rules that govern the language that is applied (Kuiper and Flindall 2000:186). They derive in part from the externally driven routine events that are covered. However, since not all actions on a court, field or race track are usually verbalized in sports commentary, these discourse structure rules also reflect the conventions that over the years in this tradition have been adopted for this specific speech task.

8.2 Discourse structure constituents for routine events

Every routine event introduced in Table 7 consists of a naturally given order of episodes. An often recurring and clearly identifiable element in basketball and consequently in the transcripts is a rule infraction, a so-called foul, which will serve as an example to demonstrate the correlation between ROUTINE EVENT STRUCTURE and DISCOURSE STRUCTURE. A foul routine occurs 40 times in the data as a narration of a visual event and co-occurs only a few times with other event narrations (the highest co-occurrence is with general player actions).

There are many different types of fouls: team fouls, personal fouls, technical fouls, flagrant fouls, etc., but the most frequent type is the personal foul, called when a player makes illegal contact with an opponent. Due to the nature of the sport, however, the majority of foul plays are not considered unsportsmanlike or exceptional - they are routine for players, coaches and audiences as much as they are routine for the commentators.

In certain situations, when the player in possession of the ball is fouled during an attempt to shoot it, a whole chain of routine event constituents is unleashed: one of the referees will whistle and call the foul, the fouled player goes to the "free-throw line" where he can shoot again in compensation, teammates will line up on the borders of the free-throw zone and try to grab the ball in case the free-throw misses the target to take over ball possession for the next play, etc. This chain of sub-events making up a foul routine is summarized in Figure 32.

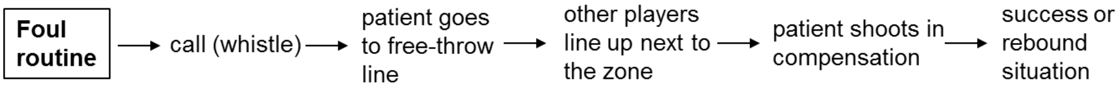


Figure 32 Event structure of the foul routine

On a personal note, the author is aware of the alleged “whistle as visual stimulus” oxymoron as first constituent of the event structure. A call must by the rules of the game always be signaled by a whistle blow of a referee, but is always accompanied by a gesture specifying the foul. In the noisy atmosphere of a full stadium, it is therefore even more likely that many foul calls are perceived by the commentators primarily by the gesturing and immediate stop of the action than the actual whistle sound.

Kuiper (2000:285) suggests that due to the sequential order of the event constituents that form a complete routine event it is also possible to model play-by-play commentary with a DISCOURSE GRAMMAR consisting of discourse structure rules that can pre-define the order of a routine event verbalization. Such a set discourse structure that reflects the routine event constituents and sequence builds the framework for semi-productive speech formulas. The foul routine discourse structure, as selected example of a frequently recurring and probably most complex routine event with its many event constituents, is depicted in Figure 33, based on a similar approach by Kuiper and Austin (1990) and Kuiper and Haggo (1985).

Not every routine event constituent in a foul call must necessarily be verbalized in play-by-play commentary, and the basketball data contains many instances where some are omitted. Such a non-mandatory set of constituents is shown in square brackets to suggest that they are optional in the commentary and do not necessarily follow every initial foul call constituent. Nevertheless, the sequence in which they occur (if they do) is predetermined by the sequence of the discourse structure constituents.

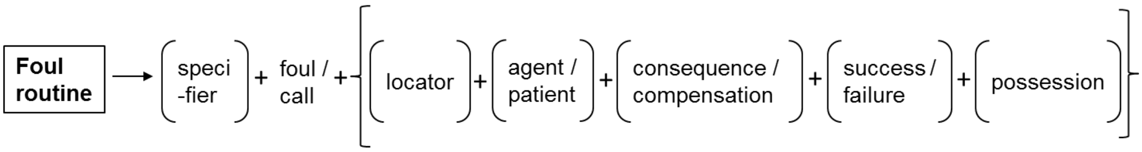


Figure 33 Discourse structure of the foul routine

Constituents in parentheses are optional in the verbalization and can be omitted, but the sequential order is partly predetermined, if they are part of the commentary. Brackets embrace those constituents that require FOUL / CALL as trigger constituent and are themselves routine sub-events.

Since the play-by-play commentator’s job is to narrate the events as they happen, every visual event narration must of course be triggered externally. The discourse structure therefore necessarily opens with the verbalization of a referee calling a foul. There is never a situation where a play-by-play commentator would talk about a foul situation if he has not mentioned a call on the court by an official beforehand.

Some constituents of the discourse routine (embedded in parentheses) are optional and are sometimes subject to ellipses in the data, even though their respective event constituents are featured in the televised coverage. One factor for the ellipsis of certain constituents in parentheses could be a lack of information due to impossible identification or an agent of the foul, for example.

In the SPECIFIER and LOCATOR constituent a foul call can for example be specified by the commentator with respect to technical details, using mostly idiomatic fixed speech formulas for that purpose, or the location where it was committed on the court. Fouls also always include an agent and patient relationship that can be communicated to the audience for further clarification with the help of the player names (AGENT / PATIENT constituent). Another optional constituent is the verbalization of the consequences that the called foul brings, which can range from loss of ball possession or free-throw compensation shots to the expulsion of a player from the game (CONSEQUENCE / COMPENSATION constituent). When compensatory free-throws are issued, which is always the case when a player get fouled during a shooting attempt or when the accumulated individual player fouls reach the collective team foul limit, it is of interest to the audience whether the executing player successfully turns the opportunity into points for his team or fails to do so (SUCCESS / FAILURE constituent). What is called POSSESSION constituent in the foul routine discourse structure of Figure 33 directly depends on the outcome of the success or failure constituent. In case there is no success, it is highly relevant for the continuing play which team can get possession of a rebounding ball, and there is usually fierce competition for that around the basket and free-throw zone.

The nature of the event routine dictates that some elements can only occur if one particular event initiates them. All optional discourse structure constituents that are within brackets in Figure 33 and explained above are those that cannot occur independently in the data, that is, without a call of a foul preceding them.

Under the assumption that formulaic speech is abundant in routine language situations that by their nature of speech task create an increased cognitive load, we can expect that most of the routine utterances from the data can be traced back to a single discourse structure of a routine event. A large advantage of this in terms of working memory process is that once a visual stimulus triggers a long-term memory representation of a routine event, the routine event immediately activates the respective discourse structure that itself is stored in long-term memory as a pre-fabricated package of constituents. The next section will provide data extracts of foul call verbalizations to demonstrate their underlying content commonalities that allow for finite-state grammar representation - a further step of automating language production.

8.3 Finite-state grammar representations for discourse structure constituents

A core characteristic of semi-productive speech formulas is that they can be represented as finite-state grammars that are indexed for particular constituents of a routine event discourse structure. With the activation of a long-term memory representation of a routine event and its discourse structure, the finite-state grammars of the speech formulas are automatically retrieved as well as an associate network. Kuiper and Austin (1990:209) summarize the properties of a finite-state grammar as follows: “Finite-state grammars are a very simple form of grammar which can be thought of as a machine which moves through a finite sequence of states emitting a word as it moves from state to state”. An example from Kuiper (2000) was given already in section 5.4.2 (see Figure 21) where the relationship between formulaic language and long-term memory was discussed.

8.3.1 Low complexity model for single constituents

Every routinized and memorized finite-state representation of a semi-productive speech formula is indexed for a particular constituent of the discourse structure, we said earlier. Considering the foul routine event and its discourse structure, for example, we find the last constituent in Figure 33 being POSSESSION of the ball after free-throw compensation. If we now look at all the visual event codes for ball possession (code G in Table 7) it should be possible to model finite-state grammars for the utterances used in the transcripts to verbalize ball possession.

Of all 56 utterances coded G for ball possession in MAXQDA10 and portrayed in Table 9 there are 36 underlined that can be modeled in one and the same finite-state representation.

code G utterance from data	*source*	*code G utterance from data*	*source*
Adonal Foyle	*13.2/1:35:20*	*Ratliff*	*13.3/0:55:19*
Dunleavy with it	*13.2/1:36:11*	*third opportunity for Portland*	*13.3/0:55:19*
the Lakers will have the ball	*13.2/1:36:11*	*Patterson the rebound*	*13.3/0:57:03*
Devean	*13.2/1:36:49*	*Kenny ANDERSON gets the offensive rebound*	*13.3/1:21*
Pietrus got a bounce	*13.2/1:38:26*	*Devean George with it*	*13.3/1:45*
Kobe with it	*13.2/1:38:39*	*Robert Horry's got the rebound*	*13.3/5:00*
rebound taken by Foyle	*13.2/1:38:39*	*Kobe's with it*	*13.3/5:00*

Dunleavy	13.2/1:38:39	Bryant	13.3/2:11:50
ball comes right back out ... to the Warriors	13.2/1:39:22	Ginobili	13.3/2:16:26
the Lakers will take it on the turnover	13.2/1:39:22	San Antonio ball	13.3/2:20:35
Robinson with it	13.2/1:45:00	Turkoglu	13.3/2:22:44
Malone's open	13.2/1:45:00	Horry with the rebound	13.3/2:22:44
Shaq with it	13.2/1:45:45	Lakers	13.5/2:31:04
Kareem Rush has it	13.3/0:41:24	Reggie	13.6/0:45
Damon	13.3/0:41:24	Davis picks it up	13.6/0:45
Shareef	13.3/0:41:24	Kobe Bryant	13.6/2:36
Dale Davis is up	13.3/0:41:24	Brian Shaw	13.6/3:54
Ratliff	13.3/0:41:24	it pops into BRYANT'S hands	13.6/5:07
Shareef	13.3/0:42:52	got it back	13.6/1:05:24
Kobe	13.3/0:43:39	Bryant	13.6/1:08:37
rebound Stoudamire	13.3/0:47:18	Prince	13.6/1:08:37
Darius Miles	13.3/0:48:34	O'Neal	13.6/1:09:32
here is Kobe	13.3/0:49:14	now Bryant	13.6/1:10:19
Portland ... runs again	13.3/0:49:48	kept it inbound	13.6/1:11:54
got it back	13.3/0:49:48	Okur	13.6/1:13:16
Zach got it back	13.3/0:53:30	Mehmet Okur	13.6/1:14:03
Payton	13.3/0:54:08	Bryant	13.6/1:17:46
Damon	13.3/0:55:19	winds up in the hands of Prince	13.6/1:18:26
code G utterance from data	*source*	*code G utterance from data*	*source*

Table 9 Code system: all samples for visual event code G (ball possession)

The finite-state representation for the selected 36 ball possession verbalizations is rather simple, because it is a quite straightforward and short routine to narrate who is holding the ball. It resembles the one of the bid-calling formulas by Kuiper (Figure 21). In Figure 34 the speech formula is presented as a diagram with arrows pointing from one syntactic constituent to the next. The shortest versions verbalized with this formula are those that only use proper names (symbolized by the variable X) of players, e.g. *Devean* or *Ginobili*, or the team name to refer to a team's ball possession, e.g. *Lakers*. These "minimal version" examples, of which we find 26 instances in the data, show that ellipses of any part of the formula are always possible and in fact most often the case. To do justice to Kuiper and Austin's definition, it would be correct to say that they do not omit the auxiliary, preposition, pronoun and possible specifier components of the formula, but make a ZERO CHOICE during the parsing in these components. Zero choices are indicated by three hyphens in the diagram. All that remains is the verbalization of the subject component to convey who is in possession of the ball.

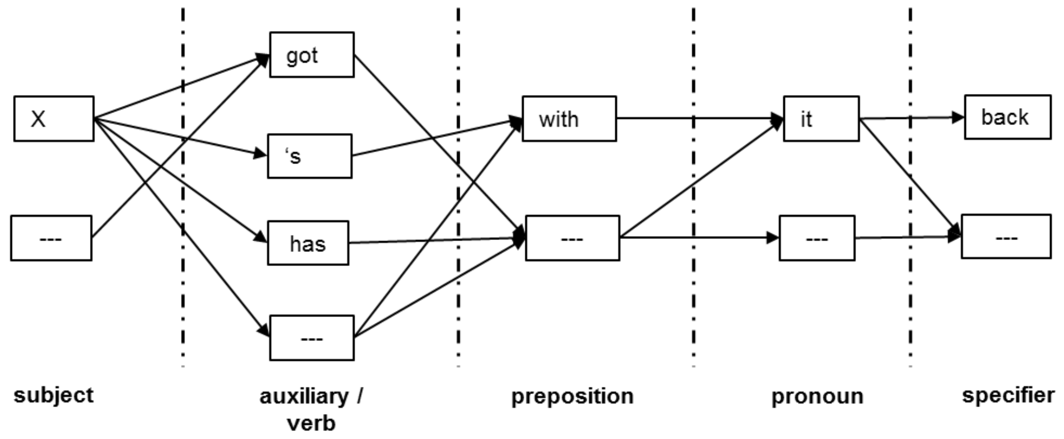


Figure 34 Low complexity model for single constituents
36 of the 56 "code G ball possession" verbalizations can be modeled in with a single finite-state representation

The true value of such a finite-state representation for a discourse constituent is that also two seemingly different and longer utterances can be placed into the same finite-state representation. In the words of Kuiper and Haggo (1985:173) these finite-state representations are the pre-fabricated speech formulas "out of which the commentary is constructed and they serve this purpose by offering, in one finite state package, a variety of paths". The chosen options for both verbalizations (1) and (2) within the same finite-state representation are highlighted in Figure 35.

(1) *Zach got it back*

13.3/0:53:30

In this first utterance the commentator starts by naming the subject by his first name *Zach* and selects *got* as the most suitable verb in the second slot. With this choice no preposition is required and the verbalization can terminate by the pronoun *it*, which always refers to the ball) and a specifier for his utterance to signal that ball possession has been regained. A zero choice is the case only for the preposition which the selected construction does not require.

(2) *Devean George with it*

13.3/1:45

In the second utterance the commentator also selects proper names to fill the open slot for the subject of the sentence. This time, first name *Devean* and last name *George* are used to clearly identify the player as subject. No auxiliary verb or full verb is chosen in the second slot and the verbalization finishes with the preposition *with* and the pronoun *it* (again referring to the ball). Here we have a zero choice both in the second and last slot of the formula.

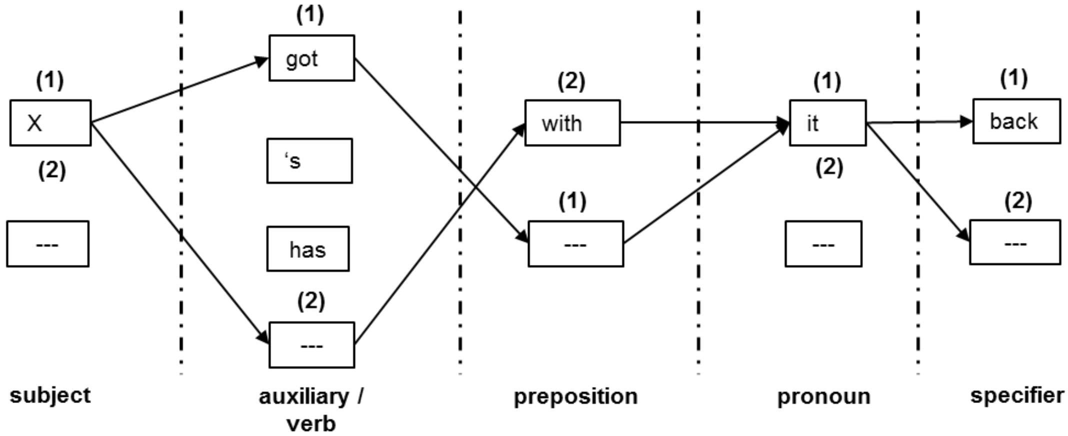


Figure 35 Identical finite-state representation for two seemingly different verbalizations
Individual paths of selection are marked with the respective data extract number (1) or (2).

The introduced ball possession finite-state representation that covers almost 65% of all ball possession verbalizations in the data was labeled as "low complexity" model because it is indexed for one constituent and covers only this one constituent. It consists of five slots and zero choices in certain slots are extremely frequent.

With all the beneficial characteristics of finite-state grammars pointed out for a single discourse constituent and for a routine event of rather low complexity, it is interesting to look back again at the previously introduced foul routine that consists of several sub-events that are triggered by the initial foul call constituent (see Figure 33). Only if it is possible to model finite-state representations for a large part of the high complexity visual event code A extracts from then the data as well, then Kuiper and Haggo's claim that play-by-play commentary relies to a large extent on semi-productive speech formulas from long-term memory has certainly passes the test and is justifiable. For this purpose all verbalizations of foul routines are collected and grouped.

8.3.2 High complexity reiteration model I: multiple discourse constituents

In extracts (3) to (9), similar ways of expressing a foul routine situation have been collected for a more detailed analysis and an attempt to model them in one finite-state diagram. The similarities are underlined for emphasis.

(3) *and <u>Patterson is fouled</u>*

13.3/0:57:03

(4) *and <u>he</u> <u>is</u> <u>FOULED</u>*

13.5/2:14:57

(5) *and <u>he's</u> <u>FOULED</u> ...(0.9) Tim Duncan ... will go to the line .. to shoot two*

13.5/2:20:35

(6) *OH <u>he's</u> <u>STOPPED</u> from BEHIND and <u>FOULED</u> ... <u>by</u> <u>Horry</u>*

13.5/2:22:44

(7) *and <u>BRYANT</u> ...(1.1) as he's moving down the COURT ...(0.9) <u>gets</u> <u>FOULED</u> ... fouled <u>by</u> <u>Tayshaun</u> <u>Prince</u>*

13.7/1:05:24

(8) *and <u>Kobe</u> <u>got</u> <u>BLOCKED</u> ... and <u>FOULED</u>*

13.7/1:11:54

(9) *<u>Medvedenko</u> will drive to the BASKET ... and <u>get</u> <u>fouled</u> on his way to the HOOP*

13.7/1:19:44

All utterances can be represented within a single syntactic framework of a finite-state representation that provides slots for individual lexical choice. The same rules for zero choices apply as explained in 8.3.1, and therefore an ellipsis of one or more lexical items in certain slots are always an option, and provides an alternative for variation in addition to the actual lexical choice.

Displayed in Figure 36, the finite-state diagram shows four slots that the speaker can fill with a pre-defined lexical item or a zero choice. The patient constituent of the discourse structure stands in the beginning and is either filled with a proper noun (variable X) or the corresponding pronoun *he.* The second slot is filled with an auxiliary verb and its variations (e.g. past tense forms, abbreviated forms) and followed by the foul constituent as third slot. The fourth and last slot allows naming the agent of the foul action, with the expression *by* + proper noun (variable X).

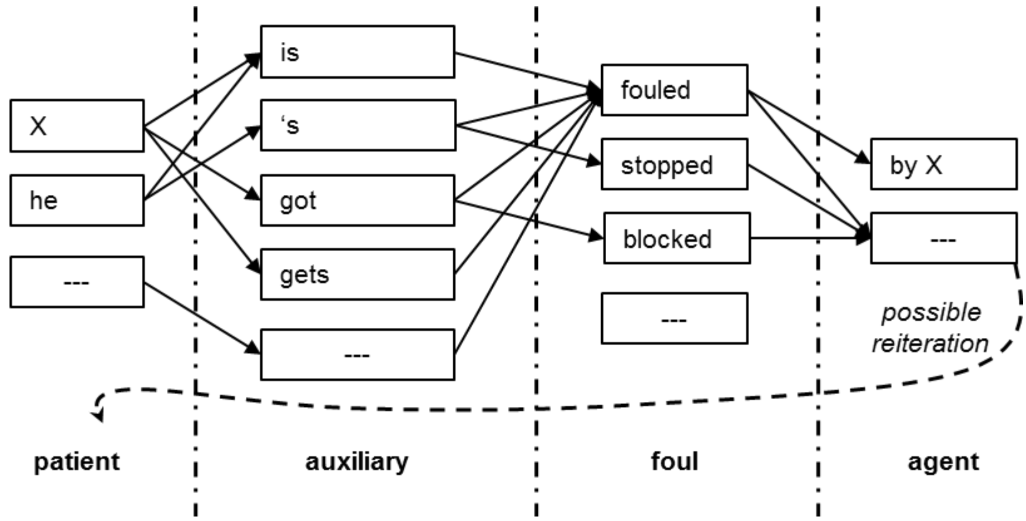


Figure 36 High complexity reiteration model I: multiple discourse constituents
Includes the discourse structure constituents PATIENT, FOUL and AGENT.

The finite-state grammar allows for reiteration and can be applied more than once in a sentence. Extract (10) is an example of how the two coordinated phrases *he's stopped (from behind) and fouled by Horry* are verbalized from the same finite-state representation by reiteration and selection of specific paths demonstrated in Figure 37. While the first part of the verbalization can be represented with an elliptical choice after the first three slots of the formula for *he's stopped* the second part is conjoined with *and* followed by a reiteration of the finite-state representation. In this second run of the same formula the patient identified already is no longer central to the commentary and is replaced by a zero choice in the first two slots for *fouled by Horry.*

(10) *OH <u>he's</u> <u>STOPPED</u> from BEHIND and <u>FOULED</u> ... <u>by</u> <u>Horry</u>*

13.5/2:22:44

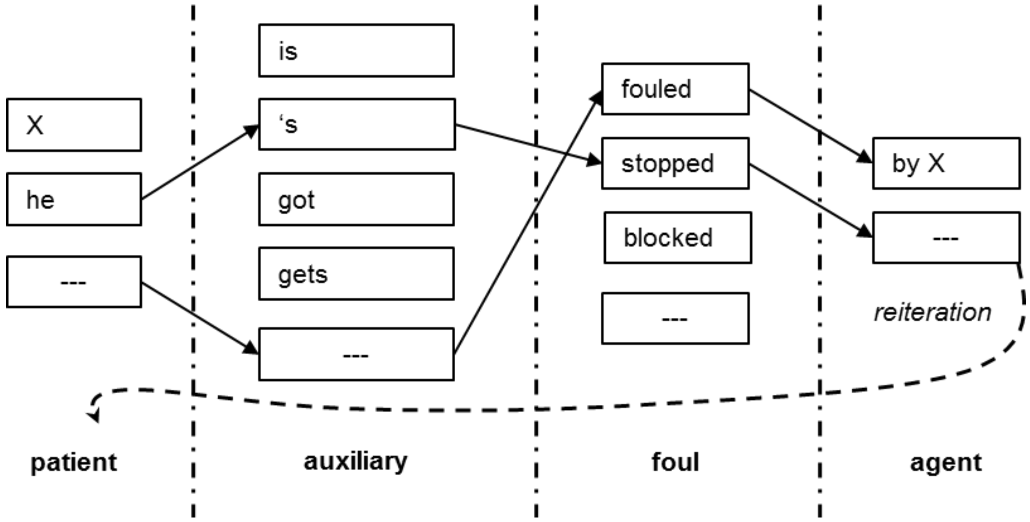


Figure 37 Reiteration of the high complexity model I
Includes the discourse structure constituents PATIENT, FOUL and AGENT with an iteration

The reason for a reiteration of a finite-state representation within a single sentence can sometimes be traced back to a delay during the identification process. In (10), for example, it is very likely that the play-by-play commentator has successfully identified the patient and type of foul but not immediately the agent of the event. Instead of causing a period of silence until the agent is identified the speaker begins his utterance with the information there is, selecting zero choices in components he cannot fill yet, and reiterates the structure once the desired identification process of the agent is complete.

8.3.3 High complexity reiteration model II: multiple discourse constituents

Another group of data extracts builds the basis for a second model of a foul routine finite-state representation. It is also of higher complexity, because it covers multiple discourse constituents of the routine. Again, similarities are underlined to emphasize the resemblances of the utterances.

(11) *<u>Devean</u> <u>George</u> ... <u>called</u> <u>for</u> <u>the</u> <u>holding</u> <u>foul</u> .. <u>against</u> <u>Mike</u> <u>Dunleavy</u>*

13.2/1:44:36

(12) *and <u>HORRY</u> <u>called</u> <u>for</u> <u>the</u> <u>OFFENSIVE</u> <u>foul</u>*

13.5/2:24:12

(13) *and a penalty .. <u>Payton called for</u> <u>his</u> ... <u>fifth</u> <u>foul</u>*

13.5/2:31:04

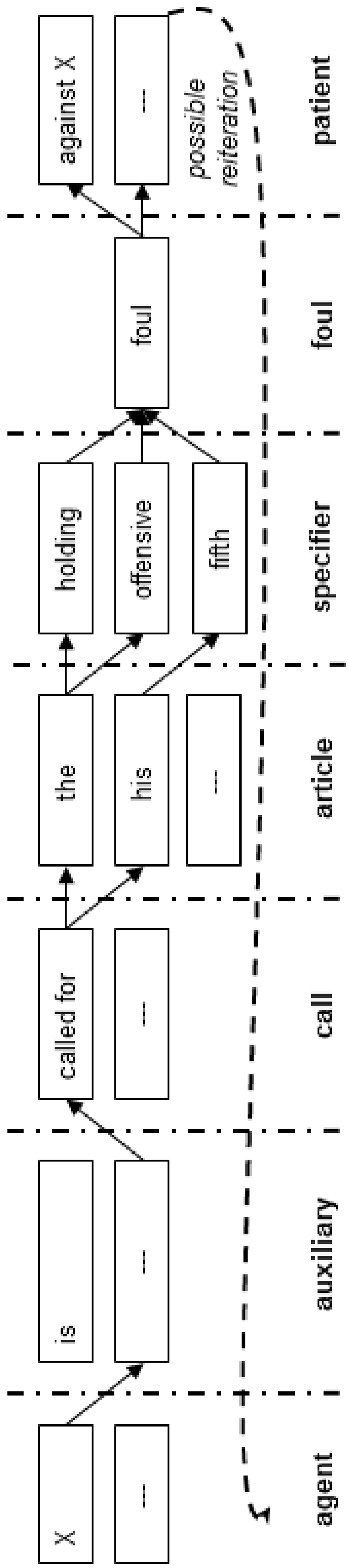


Figure 38 High complexity reiteration model II: multiple discourse constituents

Includes the discourse structure constituents AGENT, CALL, SPECIFIER, FOUL and PATIENT.

The corresponding finite-state representation for the second speech formula is displayed in Figure 38. It can be characterized as an "agent first" speech formula, which is not used very frequently, presumably because the agent identification generally takes more time than for example the foul constituent conceptualization. It covers the discourse constituents for agent and patient, as well as a very exact specification of the foul itself.

Extract (11) is the most extensive variant generated through this prefabricated syntactic structure, leaving out only the auxiliary verb slot, while (12) and (13) also elide the patient constituent of the discourse structure by a zero choice.

8.3.4 High complexity reiteration model III: multiple discourse constituents

The largest group of utterances with similar structure provides the data for a third finite-state diagram of foul routine expressions that covers multiple constituents.

(14) *the blocking foul is called on Mike Dunleavy*

13.2/1:34:32

(15) *and an OFFENSIVE FOUL is called against Devean*

13.2/1:36:49

(16) *a three second violation ... at the DEFENSIVE end ... CALLED against the Lakers*

13.2/1:40:08

(17) *OFFENSIVE foul called on .. Shareef Abdur Rahim*

13.3/0:42:52

(18) *foul called on Ruben PATTERSON*

13.3/0:55:19

(19) *foul being CALLED on the floor*

13.3/0:58:04

(20) *foul is called on PAYTON*

13.5/2:17:19

(21) *and a FOUL .. a retreat is CALLED ...(1.0) on ... PARKER*

13.5/2:21:47

(22) *and a CALL here on the LAKERS*

13.7/1:14:16

(23) *I'm looking for a travelling violation on Ginobili*

13.5/2:21:47

(24) *picked up the BLOCKING foul .. for Kobe ... to shoot TWO*

13.2/1:35:03

(25) *and a FOUL on the PLAY*

13.2/1:39:00

(26) *get the FOUL on Gary Payton and the goaltend*

13.2/1:39:05

Figure 39 shows the finite-state representation of the third group of similar utterances in the foul routine. It is the most extensive speech formula found in the data and includes six of the seven discourse structure constituents introduced in Figure 33, and can cover almost an entire foul routine verbalization with a single prefabricated syntactic framework. As the most frequently applied finite-state grammar for foul routines it accommodates almost 50% of all foul routine verbalizations in the complete coverage.
Best visible in this third complex model for semi-productive speech formulas is the possible reiteration of the structure. What sometimes appears as novel construction can in fact be placed into the same prefabricated syntactic structure with the only difference being other lexical selections within a slot. This includes most often the selection of zero choices in different slots for each run of the formula. In order to illustrate this phenomenon utterance (27) is run through the diagram in Figure 40.

(27) and a FOUL .. a retreat is CALLED ...(1.0) on ... PARKER

13.5/2:21:47

The initial turn starts with *a foul* (portrayed by the solid line arrows) and omits the specifier constituent in the second slot. It then continues with an ellipsis in lieu of the call, patient, locator and consequence / compensation constituents. These omissions are shown as zero choices in the sequence. Reiteration allows the speaker to restart with the article slot of the same syntactic structure and the utterance continues with *a retreat is called on Parker* (displayed by the dash-dotted arrows). Again, the reiteration follows after only a very short silent pause of about 0.2 seconds or less, perceived only as a break in speech rhythm rather than a real pause, most likely because the play-by-play commentator has not yet fully identified the elements of the routine event needed for a full verbalization. The speaker's choice to start with the utterance and the information he has available avoids unwanted moments of silence and, maybe more important, will not be considered as turn-taking signal by the color-commentator to take the floor. In this sense the speaker in (27) profits double from starting with the first part of his utterance already in that he can maintain the floor while creating an extra processing time window for the identification of the remaining discourse constituents.

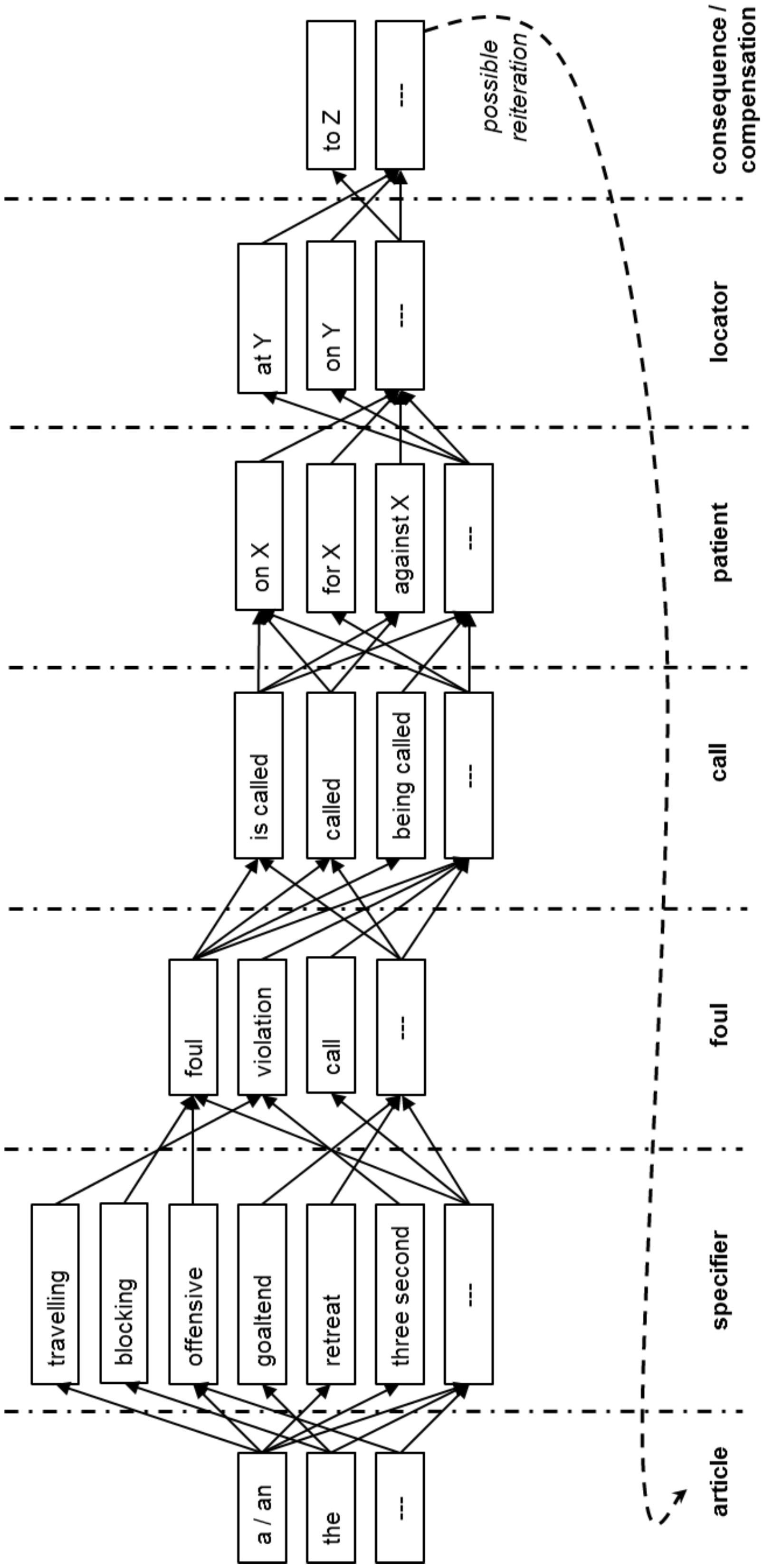


Figure 39 High complexity reiteration model III: multiple discourse constituents

Includes the discourse structure constituents SPECIFIER, FOUL, CALL, PATIENT, LOCATOR and CONSEQUENCE / COMPENSATION.

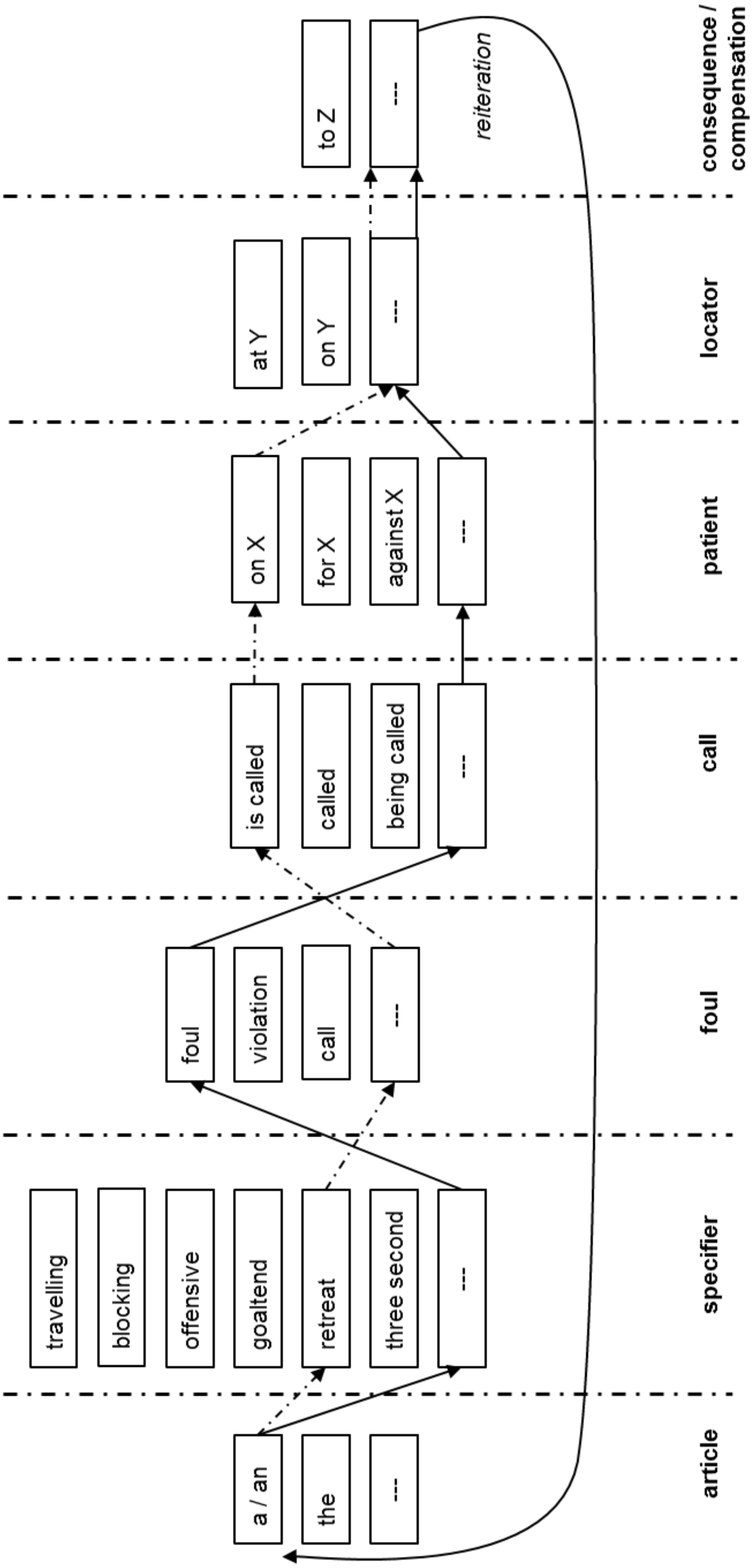


Figure 40 Reiteration of the high complexity model III

The first run of the formula is indicated by continuous line arrows, the second run by dash-dotted arrows.

In the second run through the formula the speaker already has additional information available, when he makes a zero choice for the foul constituent previously verbalized, but specifies the type of foul in the second slot. Even though he does not locate the foul routine with a lexical choice in the last locator slot, he adds the patient information during this second run.

Kuiper and Haggo (1985:170) suggest that every speech formula must be indexed for the use in a particular discourse constituent. Only then is it possible for a speaker to activate and retrieve quickly an entire prefabricated structure during or after the conceptualization of a message. As seen in the models of the high complexity finite-state representations, however, some semi-productive formulas can cover multiple discourse constituents. Therefore, it appears that at the semi-productive speech formulas investigated and portrayed in this chapter operate on an even larger scale than suggested by Kuiper and Haggo. Such complex finite-state grammars as the one for the foul routine in the data must be stored in long-term memory with an index that reflects a particular purpose.

Although it is possible to start an utterance with ellipses of some of the finite-state grammar slots, which would allow information of any slot to become topical in prominent sentence-initial position, it is most likely that a formula is retrieved according to the first successfully conceptualized elements of a preverbal message. High complexity models I-III differ not only in number and type of slots that can be filled with lexical items, but also in their sequence of the slots, which we will look at closely for each speech formula:

- High complexity model I (see Figure 36) for example can be characterized as aiding a "patient first" approach. If a player is the theme of a previous utterance already at the point when a foul is committed against him (which is highly probable, because he is in possession of the ball and therefore the focus of the play) then the player as theme is already given and can remain thematic in high complexity model I in the patient role of the first open slot. A possible index in long-term memory for this particular speech formula could therefore be:

FOUL ROUTINE → condition: [patient identification priority]

- High complexity model II (see Figure 38) in contrast would ease the verbalization of an "agent first" utterance. The idea of an agent in prominent position of a foul routine does not contradict the arguments above for the first speech formula, because rules of basketball allow also for a player in possession of the ball to commit a so-called offensive foul. What is thematic in the discourse by earlier utterances can therefore also remain thematic in high complexity model II. The corresponding index for retrieval from long-term memory could therefore be:

FOUL ROUTINE → condition: [agent identification priority]

- High complexity model III (c.f. Figure 39) is the most frequently used finite-state representation for the foul routine in the data and sets the foul call constituent of the discourse structure in prominent position. This goes against Ferguson's (1983:155) observation that in sports commentary typically "the subject is a player's name, the verb is the copula or – less often – a verb of motion such as *come* or *go*". An explanation for this inversion is presented by Green (1980:585) who argues that "by postponing the reference to the name of the player to the end of the sentence allows [the speaker] to begin describing what is directly observable… while (in real time) remembering or figuring out who [the player] is". A construction with high complexity model III automatically postpones the naming of the agent or patient and gives the speaker slightly more time for their identification. An index for speech formula III in long-term memory must therefore contain the information:

FOUL ROUTINE → condition: [foul call conceptualization priority]

8.4 Processing reduction potential

Chapter 8 pins down what semi-productive speech formulas are, what frameworks they require, and how they operate. In a step-by-step fashion the preconditions of routine events have been elaborated. After that it was possible to visualize the underlying event structure of selected routines. Since in the concluding words of Kuiper and Flindall (2000:203) speech is largely formulaic in situations "where routine actions are accompanied by routine speech", discourse structures have been worked out that match these event structures. Finally, finite-state representations of semi-productive speech formulas that match single or multiple discourse structure constituents could be modeled and portrayed in diagrams. To visualize the dependency of a finite-state state grammar for semi-productive speech formulas on all previous steps, Figure 41 summarizes the hierarchical elaborations of this chapter.

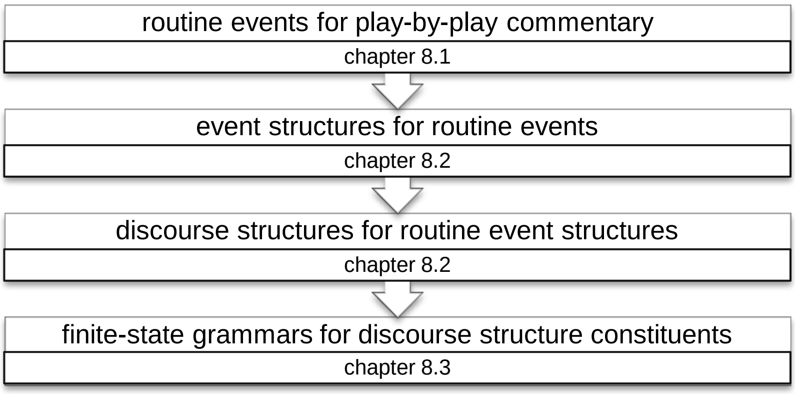


Figure 41 Preconditions for finite-state grammars of semi-productive speech formulas

A discussion about the reduction potential of working memory processes by the use of semi-productive speech formulas is best split in three parts that correspond to the three autonomous process components of language production by Levelt (1989) in Figure 26 and the elements of language production requiring working memory resources introduced in 7.1. Levelt’s model suggests that most production effort and hence most working memory resources could be saved within the conceptualizer and the formulator, because the articulator is largely automatic already under normal circumstances.

8.4.1 Processing reduction potential within the conceptualizer

The conceptualizer (c.f. 7.2.1) is the first component in which streams of visual stimuli are processed. The first two of the five main processes within the conceptualizer are SEGMENTATION, where the stimuli relevant for a conceptualization are selected, and STRUCTURING, during which spatial and temporal information is elicited to form a hierarchical structure for an event formation. Since the application of a semi-productive speech formula requires the existence of routine events with recurring identical event structures, it is possible that these two processes can be carried out with less control and fewer working memory resources, because concepts about the play-by-play relevant events are already established - and so are their respective event structures and in part their spatial or temporal hierarchy.

The macroplanning stage of the conceptualizer can be automatized to a certain degree thanks to the routine events and their routinized event structure that are held in long-term memory. Microplanning consists of SELECTION, LINEARIZATION and PERSPECTIVATION where a contact with the semantic and conceptual lexicon takes place to arrange selected items into a propositional format in order to produce a finalized preverbal message in propositional form. Here we can similarly argue that the preverbal aspects of semi-productive speech formulas that are manifested in the existence of routine events and routinized event structures certainly have the potential to ease the microplanning processes, considering that for example an event structure leaves little room for the linearization process. It is likely that the most attention has to be invested in the selection of particular objects and entities to fill the information gap for the given structures.

A preverbal message after the stage of conceptualization must be able to trigger the retrieval of the most suitable finite-state representation from long-term memory. Whether the retrieval can take place already during conceptualization is subject to speculation. The possibilities of constituent omission and reiteration enable an early activation of the formula from long-term memory hypothetically as early as the routine event is identified and the discourse structure activated and retrieved.

8.4.2 Processing reduction potential within the formulator

The formulator, as introduced in 7.2.2, is a tripartite component that processes the preverbal message of the conceptualizer. The CHOICE OF LEXICAL items which can never be fully automatic according to Garrod and Pickering (2007:6) can by definition not be fully automatized by semi-productive formulas either. It would make semi-productivity impossible and ruin the avenues for speaker individualities and commentary idiosyncrasies. Nevertheless, we have seen in the finite-state representations of 8.3 that a large number of verbalizations in the data are produced with a rather small set of choices within a slot of a finite-state diagram. Consequently, the choice for lexical items is narrowed down significantly and uses fewer working memory resources than in completely novel utterances where there is a much larger (although finite) choice of suitable lexical items - especially with technical terms in mind that are the prototypical "ways of saying it".

Once the lexical items are selected the next process within the formulator is GRAMMATICAL ENCODING. It has been pointed out that this process is difficult to qualify in terms of working memory resource demand (c.f. Garrod and Pickering 2007:7) and that it is best described as a mix of both automatic and controlled sub-processes. We have mentioned that more complex grammatical structures are more difficult to produce. Thinking of passive constructions, subordinate structures or maybe most emphatically Kuiper's (2000:280) sample of center embedding "*the boy the man the people loved saw died*", which alone almost exceeds our working memory capacity in producing or understanding them, this assumption seems plausible. The advantage of the semi-productive speech formulas modeled in 8.3 is that by reiteration of the same finite-state representation embedding is avoided and the sentence structures remains relatively simple. Kuiper (2004:49) attributes a high processing reduction potential of working memory resources to these flat structures that are enabled by the speech formulas.

8.4.3 Processing reduction potential within the articulator

The articulator, in more detail discussed in 7.2.3, is already largely automatic and offers little room for optimization through semi-productive speech formulas. The only evidence that formulaic language is beneficial in terms of working memory resource demand also for elements within the articulator comes from Wood (2002:8): “an intriguing aspect of the storage and retrieval of formulas as wholes is the idea that they are articulated as wholes as well. This allows for the phonological coherence that is characteristic of their production”.

In conclusion, although it is difficult to estimate to exactly what degree pre-fabricated speech formulas and their frameworks reduce working memory demand on the pathways of visual stimuli to articulation, there are several processes in all three components of language production where formulaic language can bypass working memory in some ways. Whether the sum of these entire individual working memory load reductions making up the overall processing reduction potential of pre-fabricated speech formulas is large enough to enable fluent and effective speech during a speech task under heavy working memory load, as suggested by the research hypothesis, will be the central focus of the corpus results and implications presentation in chapter 9.

9 CORPUS RESULTS AND IMPLICATIONS

"Kobe gets down in the lane nice pass out to Payton thought about the three rolls down the lane difficult oh Shaq hammered it home in traffic."
Paul Sunderland (13.2/1:45:45)

Based on the indicators of increased cognitive load in speech production that have been elaborated in 7.3 the corpus analysis seeks to find statistical evidence to corroborate the hypothesis that recurring events in visual event narration routines create an environment where pre-fabricated speech formulas can be applied to a high degree to ease the overall burden on working memory. Each indicator variable is tested in the highly formulaic play-by-play commentary part of the transcripts and the comparative data of non-formulaic color-commentary. If the research hypothesis holds, we should expect statistical evidence that play-by-play commentary shows fewer or less frequent indicators of cognitive load in speech production than color-commentary - despite its working memory resources taxing dual task.

9.1 Pausing: silent pauses

9.1.1 Definition and methodology

Silent pauses have been measured and included already during the transcription process of the sports commentary data and are therefore visible and easily identifiable in the transcripts of chapter 10. Three different transcription symbols are used. Extremely short pauses that are perceived only as a break in speech rhythm and last 0.2 seconds or less are marked with two dots. Medium silent pauses that last between 0.3 and 0.6 seconds are indicated by three consecutive dots. All silent pauses with a longer duration than 0.7 seconds were measured individually and transcribed in detail with three dots followed by the pause duration in brackets. Sample (28) from the data illustrates these three different categories of silent pauses. A short pause in between a false start is followed by a long pause of 1.6 seconds before the commentary type switches from color-commentary to play-by-play commentary and a medium pause marks the shift back again from visual event narration to color-commentary.

(28) *Speedy CLAXTON mix-* ***..*** *missed twenty games* ***…(1.6)*** *ROLL DOWN the lane and ADONAL Foyle* ***...*** *TOUGH CHANCE*

13.2/1:35:20

All three categories of silent pausing have then been coded in MAXQDA10. A total of 2007 silent pauses are found in the six transcripts, including the silent gaps in the commentary that belong to the onset latency of each turn. As there are many speaker turns during the commentary, all pauses that precede the first utterance in a turn were excluded for statistical purposes to ensure that only pausing during ongoing speech is considered in the results. Table 10 presents the results for each pause category as well as the total of silent pauses found in all transcripts. The difference between the 2007 initially coded and those 1671 eventually selected reflects the eliminated silent pauses that are onset latencies of a newly started speaker turn. Results are generally given in absolute count (#) and a ratio per hundred words (/100 words) to visualize frequency to allow for comparison.

Silent pauses (without onset latency)	*All transcripts (13.2-13.7 combined)*	
	#	*/100 words*
total	**1671**	**15.36**
short	492	4.52
medium	919	8.45
long	260	2.39

Table 10 Silent pauses without onset latencies: all transcripts
= count /100 words = ratio of count per hundred words

We find that medium pauses are the most frequently encountered ones in sports commentary, occurring on average after roughly every eighth word in the transcripts. The relatively low number of long pauses is in accord with the purpose and manner of sports commentary described earlier: moments of silence are generally not desired in a live coverage on television.

9.1.2 Expectation based on the research hypothesis

According to the review of previous experiments and studies by Jameson et. al (2010) introduced in section 7.3.1 there is almost unanimous agreement that with increasing cognitive load the number as well as the duration of silent pauses are increasing as a consequence. Without the current working hypothesis in mind, a statistical comparison between play-by-play commentary where the cognitive load is higher and color-commentary where speech is not tied to time-pressured visual event narrations should therefore result in more silent pauses and longer silent pauses during play-by-play commentary.

With respect to the research hypothesis on speech formulas in routine language, which is enabled by the nature and environment of play-by-play commentary, a different tendency should be visible. A trend towards leveling the number and duration of silent pauses, or even a reversal to fewer and shorter silent pausing, between play-by-play and color-commentary would be in favor of the research hypothesis.

9.1.3 Frequency results

All silent pauses for play-by-play commentary that provide the suitable environment for semi-productive speech formulas were separately analyzed for each transcript 13.2-13.7 and are displayed in Table 11. Results for each coded category of silent pausing (short, medium, long) are listed, as well as the total sums. Since the lengths of each transcript vary, the key comparative number is the frequency that is calculated in relation to hundred words spoken in the transcript.

play-by-play	*13.2*		*13.3*		*13.4*	
	#	*/100 words*	#	*/100 words*	#	*/100 words*
total	84	17.50	60	13.73	20	8.06
short	31	6.46	13	2.97	7	2.82
medium	50	10.42	26	5.95	12	4.84
long	3	0.63	21	4.81	1	0.40

play-by-play	*13.5*		*13.6*		*13.7*	
	#	*/100 words*	#	*/100 words*	#	*/100 words*
total	67	26.80	17	16.35	64	18.29
short	9	3.60	8	7.69	8	2.29
medium	33	13.20	5	4.81	29	8.29
long	25	10.00	4	3.85	27	7.71

Table 11 Silent pauses: numbers and frequencies in play-by-play commentary
= count /100 words = ratio of count per hundred words
short; ≤ 0.2 sec. medium; > 0.3 sec < 0.7 sec long; ≥ 0.7 sec

The identical statistical information for color-commentary is displayed in Table 12 for each transcript individually.

color-commentary	*13.2*		*13.3*		*13.4*	
	#	*/100 words*	#	*/100 words*	#	*/100 words*
total	235	16.48	228	14.26	69	8.89
short	105	7.36	62	3.88	17	2.19
medium	112	7.85	112	7.00	43	5.54
long	18	1.26	54	3.38	9	1.16

color-commentary	*13.5*		*13.6*		*13.7*	
	#	*/100 words*	*#*	*/100 words*	*#*	*/100 words*
total	440	18.67	79	9.34	308	15.34
short	152	6.45	29	3.43	51	2.54
medium	250	10.61	40	4.73	207	10.31
long	38	1.61	10	1.18	50	2.49

Table 12 Silent pauses: numbers and frequencies in color-commentary
= count /100 words = ratio of count per hundred words
short; ≤ 0.2 sec. medium; > 0.3 sec < 0.7 sec long; ≥ 0.7 sec

A visualization of the statistical information for silent pause frequencies in each transcript reveals some idiosyncrasies and parallels displayed in an overview in Figure 42. While the frequencies of all three silent pause categories combined as total are in most cases higher, and only in 13.3 and 13.4 insignificantly lower during the part of visual event narration, results for the individual categories show that there is greater variation.

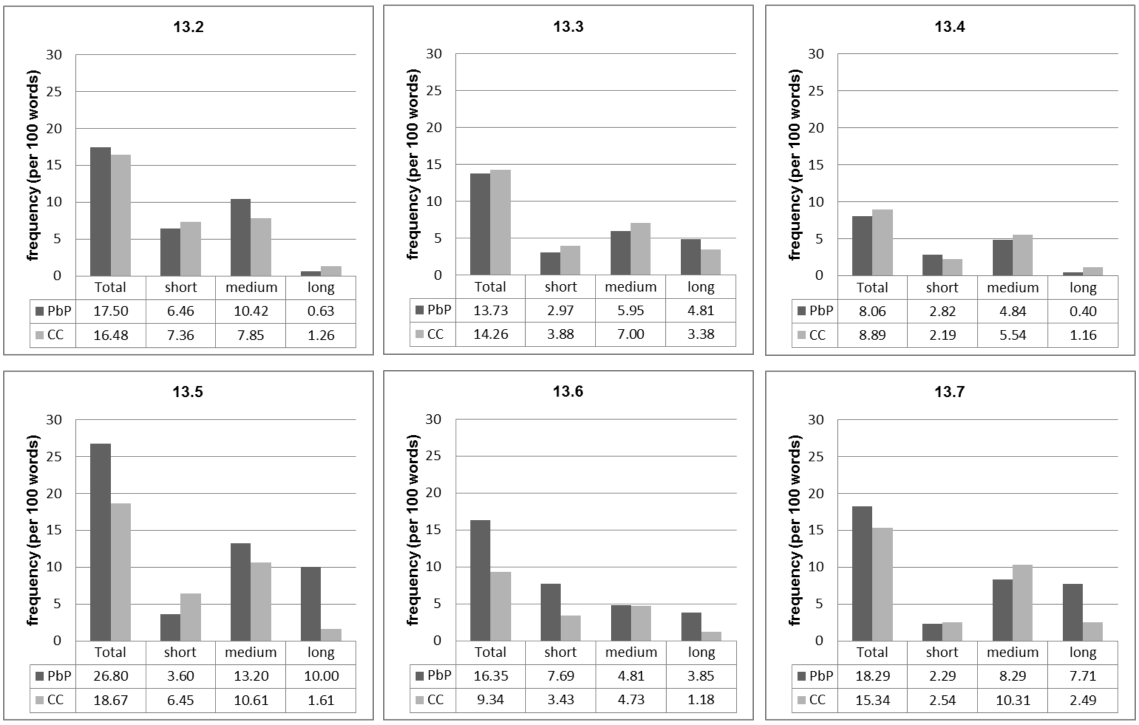


Figure 42 Silent pauses: frequencies for each transcript
PbP = play-by-play / visual event narration CC = color-commentary / free speech
short; ≤ 0.2 sec. medium; > 0.3 sec < 0.7 sec long; ≥ 0.7 sec

Especially long pauses with duration of more than 0.7 seconds are found significantly more frequently in play-by-play commentary in four of the six transcripts. An opposite trend is visible for short pauses that are perceived as a short break in speech rhythm and last only about 0.2 seconds, where only two transcripts have higher frequency values during visual event narration.

9.1.4 Pause duration results

In order to generate statistical information for durations of silent pauses a mean value for the coded short and medium pauses is required. Due the fact that manually stopped pauses cannot be measured completely accurately the categories where initially defined with a gap of a tenth of a second between each category and all results rounded to a tenth of a second as well. For short pauses that are transcribed with a convention referring to anything that is perceived as a break in speech rhythm up to 0.2 seconds, the value of 0.2 seconds is selected to calculate the total duration. For medium pauses that in the transcripts mark silent pauses within a defined range (≥ 0.3 seconds and ≤ 0.7 seconds) a mean value of 0.45 seconds per pause was adopted. Long pauses that by the current definition cover any silent pause that is longer than 0.7 seconds do not require a mean value, as their exact duration with the precision of a tenth of a second is already explicit in the sports commentary data. Long pauses are therefore individually collected initially for each transcript and later for the complete data corpus.

Table 14 and Table 15 present the silent pause durations in seconds for play-by-play commentary and color-commentary respectively. In transcript 13.3, simply as demonstration of one particular result, there are for example 26 medium pauses found in play-by-play commentary, which multiplied by the mean value for medium pauses results in a total duration of 11.7 seconds.

play-by-play	*13.2*		*13.3*		*13.4*	
	#	*duration*	*#*	*duration*	*#*	*duration*
short	31	6.20	13	2.60	7	1.40
medium	50	22.50	26	11.70	12	5.40
long	3	3.10	21	60.50	1	2.30

play-by-play	*13.5*		*13.6*		*13.7*	
	#	*duration*	*#*	*duration*	*#*	*duration*
short	9	1.80	8	1.60	8	1.60
medium	33	14.85	5	2.25	29	13.05
long	25	51.30	4	4.10	27	49.90

Table 13 Silent pauses: duration in play-by-play
# = count
duration = time in seconds
short = mean value of 0.2 sec
medium = mean value of 0.45 sec
long = individual values calculated (no mean value)

Even though long pauses have a very wide range in the data (with the shortest lasting the minimum of 0.7 and the longest 17.2 seconds) the duration of medium pauses combined make up the largest part of silent time within the commentary. Except for transcript 13.3 medium pauses make up an incredibly large proportion of total silent pausing time, considering the mean value of only 0.45 seconds.

color-commentary	*13.2*		*13.3*		*13.4*	
	#	*duration*	#	*duration*	#	*duration*
short	105	21.00	62	12.40	17	3.40
medium	112	50.40	112	50.40	43	19.35
long	18	17.60	54	103.30	9	15.00

color-commentary	*13.5*		*13.6*		*13.7*	
	#	*duration*	#	*duration*	#	*duration*
short	152	30.40	29	5.80	51	10.20
medium	250	112.50	40	18.00	207	93.15
long	38	55.70	10	26.70	50	89.00

Table 14 Silent pauses: duration in color-commentary

# = count
duration = time in seconds

short = mean value of 0.2 sec
medium = mean value of 0.45 sec
long = individual values calculated (no mean value)

In order to visualize the differences in silent pause durations between visual event narration elements of the sports commentary data and the free speech elements where there is no additional cognitive burden, it is necessary to set the above results in relation to the actual speech time of each commentary type. For each silent pause category the combined duration of all transcripts are therefore calculated as a percentage of the full duration of both play-by-play commentary and color-commentary.

The graphs in Figure 43 elicit awareness that the pause categories behave differently. While there is a visible trend that short pauses cause longer periods of silence in color-commentary than in play-by-play commentary (2.9% to 2.1%) and the same holds for medium pauses (12.2% to 10.5%), long pauses span more than double the length in play-by-play commentary as compared to color-commentary (18.0% to 10.6%). This discrepancy in the comparison between the individual pause category durations must be taken into consideration in the interpretation of silent pause behavior as a whole.

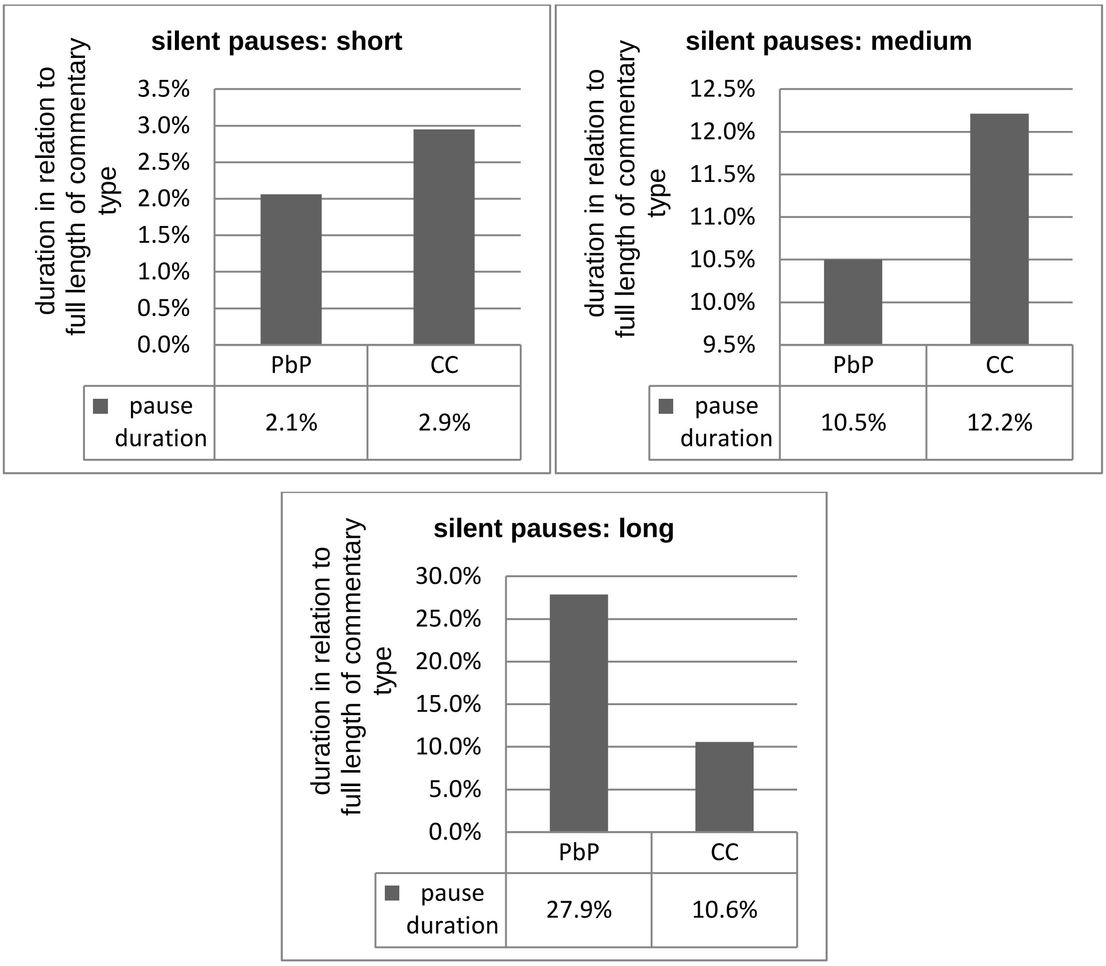


Figure 43 Silent pauses: durations for each pause category
Durations of each silent pause category in relation to the full duration of both play-by-play commentary and color-commentary, expressed in percentage

9.1.5 Conclusion: silent pauses

The analysis of silent pauses was divided into pause frequency on the one hand and pause duration on the other hand. Both frequency and duration have previously shown to increase under a higher cognitive load (c.f. section 7.3.1) and should accordingly also be higher in play-by-play commentary than in color-commentary. A leveling or reverse trend of the symptoms that are indicators of increased cognitive load in speech production is therefore seen as evidence that speech formulas which operate to a much higher degree in the routine environment of play-by-play commentary can reduce the demand for working memory resources.

In terms of pause duration the analysis has produced no results that show a positive effect of speech formulas. The trend in the literature holds also for sports commentary, with pause durations being significantly longer in play-by-play commentary under higher cognitive load than in color-commentary. Figure 44 summarizes the results for pause durations of all transcripts combined and visualizes the affirmation of the trend in the reviewed literature. In play-by-play commentary the duration of silent pauses is significantly higher and in fact making up about 40% of the entire play-by-play commentary length. This is such a surprisingly high amount of pausing, considering that the purpose of sports commentary is to constantly narrate the visual events that are ongoing on the court, that a closer look at this symptom in combination with the second variable (frequency) is required.

Figure 45 shows the combined results for the complete data corpus for pause frequencies of short, medium and long pauses. In play-by-play commentary (left, dark columns) short pauses and medium pauses occur less often than in color-commentary. Since according to the literature review by Berthold and Jameson (1999) silent pausing frequency should increase during a higher demand on working memory resources, this observation marks a reverse tendency for both short pauses medium pauses. Even the relatively small difference between commentary types in the category of medium pauses, which could be characterized as a leveling more than a reverse trend, contradicts the clear trend found in previous studies (e.g. Rummer 1996).

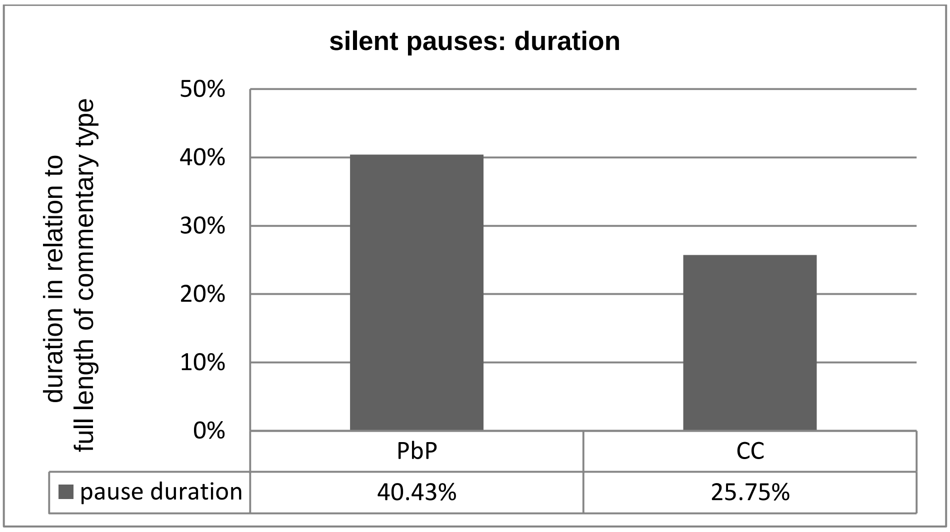


Figure 44 Silent pauses: durations overall

Long pauses, however, occur with more than twice the frequency in visual event narration. One the one hand, this would be in accordance with the observations in the literature presented in 7.3.1, on the other hand it also explains the overall results of pause duration, as a high frequency of long pauses directly affects the total duration of silent pausing. Nevertheless, the case can be made that the analysis of silent pauses generated support for the working hypothesis on the grounds of two arguments:

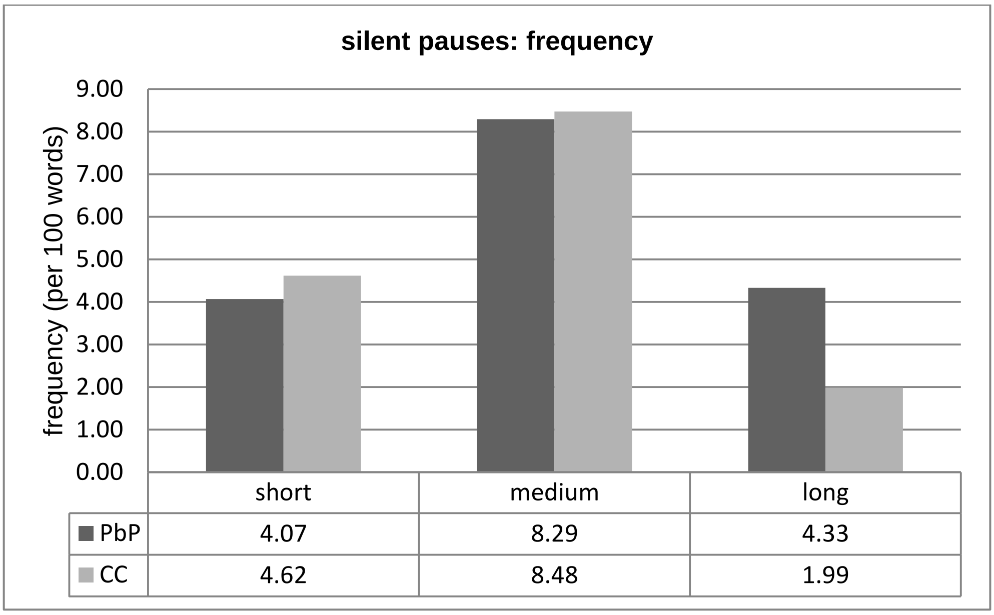


Figure 45 Silent pauses: frequency overall

First, the nature of televised sports commentary plays into the results insofar as the play-by-play commentator as primary speaker generally holds the floor and can only be interrupted if either there is no visual event to narrate (that is, when he is already in color-commentary mode) due to a break in the action or if a shift into color-commentary is desired (either by himself or the designated color-commentator). The play-by-play commentator is the only speaker who can shift between the commentary types, since designated color-commentators are not “allowed” to also report play-by-play. Due to the constraints deriving from these speaker roles, long pauses are the most common turn-taking signals that allow a color-commentator to take the floor, and can as such by definition only occur during play-by-play commentary.

Second, in 7.3.1 it has already been suggested that pausing due to a working memory overload would manifest itself more likely in a break of speech rhythm, a hesitation rather than a complete breakdown for several seconds. Short pauses and medium pauses are therefore assumed to be better indicators in the detection of cognitive load in speech output than long periods of silence.

With the above two arguments in mind the silent pause results look somewhat different and could in fact be interpreted more in favor of the working hypothesis than at first sight. Leaving aside the high frequency of long pauses in play-by-play commentary that are at least in part caused by their function as turn-taking signals, the distribution in the sports commentary data of silent pauses up to 0.7 seconds alone would suggest that play-by-play commentary is produced under less overall cognitive load.

9.2 Pausing: filled pauses

9.2.1 Definition and methodology

There is no specific transcription symbol in the data corpus that would highlight filled pauses as there is for silent pauses, because filled pauses can consist of varying sounds or sequences of sounds. It is therefore not possible to automatically code filled pauses for statistical analysis in the MAXQDA10 software. A manual coding of the complete sports commentary data has shown very little variation though. Only three different sounds or sound sequences that were used in the transcripts could be clearly identified as fillers. Extract (29) and (30) serve as samples to show how these fillers are present in the data.

(29) *there is the case again that where **er** when Shaquille is on the weak side … and he's trying to get **erm** movement across the key*

13.4/1:53

(30) ***ah**:: ... the big fella said if I get a f- .. free **er** .. PATH to jump*

13.2/1:46:04

A total of 56 sounds and sound sequences that could be assigned to filled pauses have been identified in all transcripts 13.2-13.7 and presented in Table 15, with the “schwa” sound (transcribed as *er*) being by far the most dominant. Only two other variants, *ah* once and *erm* twice, are found.

Filled pauses	*All transcripts (13.2-13.7 combined)*	
	#	*/100 words*
total	**56**	**0.51**
ah	1	
erm	2	
er	53	

Table 15 Filled pauses: number and frequency in all transcripts
\# = count /100 words = ratio of count per hundred words

9.2.2 Expectation based on the research hypothesis

In the literature review on filled pauses by Berthold and Jameson (1999) outlined in 7.3.1 the majority of the studies report an increase in frequency during high cognitive load situations.

These results have also been replicated by Müller et al. (2001), Khawaja et al. (2007) and Jameson et al. (2010) where subjects in experimental settings have used more filler sounds to bridge a gap during their utterance under conditions of both time pressure and higher cognitive load deriving from a dual task. As the vision-to-word transformation constitutes a similar dual task to the navigation task applied in Müller et al. and Jameson et al. there should be a higher frequency of filled pauses in play-by-play commentary than in color-commentary.

On the grounds of the research hypothesis, however, the formulaic routine language in play-by-play commentary could diminish the additional demand on working memory usually deriving from the speech task to degree that an opposite trend is observable.

9.2.3 Filled pauses results

An individual statistic for each transcript is presented in Table 16. The actual count (#) and the frequency measured per hundred words (/100 words) of the commentary type is provided.

Transcript	*Total*	
	#	*/100 words*
13.2	16	0.84
13.3	16	0.79
13.4	10	0.98
13.5	11	0.42
13.6	0	0.00
13.7	3	0.13

Table 16 Filled pauses: number and frequency for each transcript
\# = count /100 words = ratio of count per hundred words

What cannot be directly deduced from the results in Table 16 are the individual differences of the speakers contributing to the overall data. Speaker “Paul” for example is the play-by-play commentator in 13.2 and 13.4, “Stu” is Paul’s fixed partner and appears as color-commentator also in 13.2 and 13.4, while “Doug” provides the color-commentaries in 13.5 alongside a second color-commentator (in a trio unique in the data) as well as in 13.6 in combination with another play-by-play commentator.

In Figure 46 and Figure 47 the results have been arranged to highlight speaker idiosyncrasies for the five play-by-play commentators and five color-commentators. Despite the rather high frequency of filled pauses by color-commentator Stu, there is no clear trend visible between the two commentator guilds. With Marv there is a speaker that uses filled pauses significantly more frequently than the other four play-by-play commentators. There is also one speaker in each group not using filled pauses at all in the transcripts. The frequencies of the remaining three play-by-play commentators (Paul, Al, and Mike) and three color-commentators (Mike F, Doc, Doug) are all within a similar range. The visualization of speaker idiosyncrasies in terms of filled pause frequency therefore reveals no striking differences that one could typically attribute to each speaker guild.

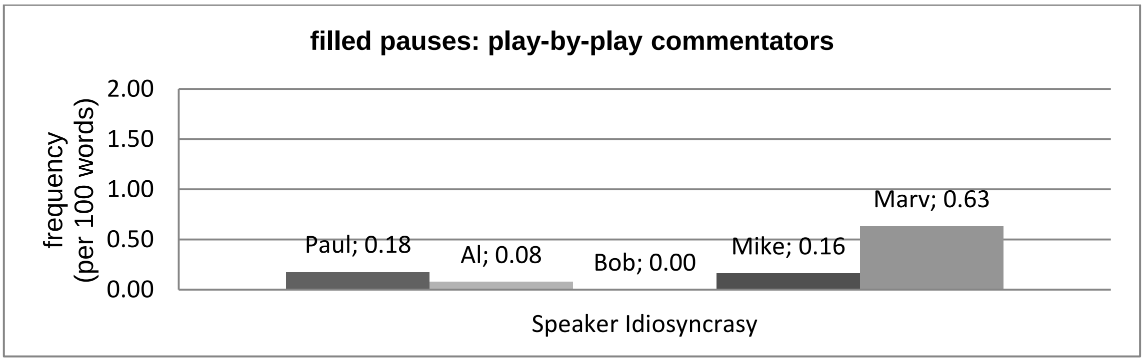


Figure 46 Filled pauses: speaker idiosyncrasies (play-by-play commentators)

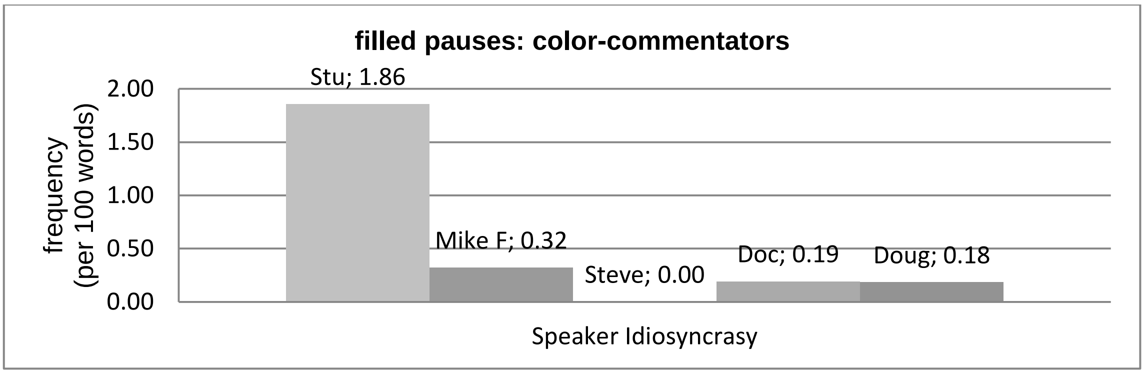


Figure 47 Filled pauses: speaker idiosyncrasies (color-commentators)

Statistics of the coding with respect to commentary type for each transcript is provided in Table 17. With this data it is possible to explore during which speaker role the designated play-by-play commentator produce filled pauses.

Transcript	*PbP*		*CC*	
	#	*/100 words*	*#*	*/100 words*
13.2	0	0.00	16	1.12
13.3	0	0.00	16	1.00
13.4	0	0.00	10	1.29
13.5	1	0.40	10	0.42
13.6	0	0.00	0	0.00
13.7	0	0.00	3	0.15

Table 17 Filled pauses: number and frequency for each commentary type
# = count /100 words = ratio of count per hundred words
PbP = play-by-play / visual event narration CC = color-commentary / free speech

Except for one single instance in 13.5 all filled pauses occur during color-commentary, despite the fact that the speakers who provide play-by-play commentary overall do not show a different usage pattern than their color-commentator counterparts, as shown in the speaker idiosyncrasies in Figure 46 and Figure 47.

9.2.4 Conclusion: filled pauses

The overall comparison of filled pauses in all transcripts taken together (c.f. Figure 48) is in favor for the research hypothesis, because except for one single filled pause in 13.5 this symptom of speech under cognitive load is inexistent in the play-by-play commentary part of the data.

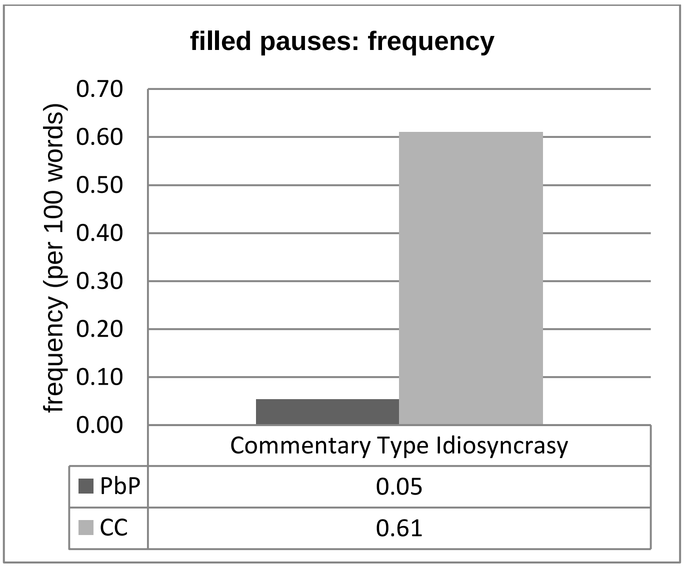


Figure 48 Filled pauses: frequency overall
PbP = play-by-play / visual event narration CC = color-commentary / free speech

Admittedly, the wide range of speaker idiosyncrasies among the color-commentators, with one particular color-commentator showing a noticeably higher usage of filled pauses than the other seven speakers, may not produce very reliable values of frequency for color-commentary in general. However, the almost zero distribution in the formulaic environment of visual event narrations confirms at least that the tendency is in favor of the research hypothesis in that it contradicts the trends found by Müller et al. (2001), Khawaja et al. (2007) and Jameson et al. (2010) as well as the majority of the studies reviewed by Berthold and Jameson (1999).

9.3 Output quality: disfluencies

Different from the other subchapters of the corpus results and implications the definition and methodology of the indicators of cognitive load are provided separately for each group of disfluencies. A general assumption on overall disfluencies with respect to the current research hypothesis can however be made on the basis of the study review by Berthold and Jameson (1999).

9.3.1 Expectation based on the research hypothesis

In previous studies many indicators of speech under cognitive load have been analyzed and eventually grouped together as disfluencies. For some individual indicators the literature review by Berthold and Jameson (1999) provides a detailed tendency of behavior (i.e. repetitions and false starts) but results for the application attempts of automated cognitive load detection are only available as a whole group of disfluencies.

The two experimental studies (Müller et al. 2001 and Jameson et al. 2010) that combined all individual indicators into one disfluency symptom both report a similar increase (about 3%) of overall disfluencies in high cognitive load settings. The increase was almost identical, whether the experiment included a time pressure condition in addition to the cognitive load increase or not.

With respect to the research hypothesis on speech formulas in visual event narrations a reversed tendency of fewer disfluency phenomena in play-by-play narrations compared to color-commentary is expected as an overall result of the sports commentary data.

9.3.2 Articulation errors, slips of the tongue, stuttering

In this section all noticeable speech errors of individual sounds or syllables are subsumed. No individual coding is conducted for articulation errors, slips of the tongue and stuttering in this section and results will therefore refer to the whole group. As stuttering only repetitions of parts of a word are included as in (31), because repetitions of complete words or phrases are treated as an own disfluency category in section 9.3.5. A slip of the tongue as disfluency, as in (32), is a specific articulation error where a sound is carried over from a word into another word, either in anticipation of a following word or as a trace of a previous word for a consecutive one. Mispronunciations of single sounds, as in (33), are here simply referred to in general as articulation errors.

(31) *nice assist by Kobe ... that's a goo- good DEFENSE*

13.2/1:38:18

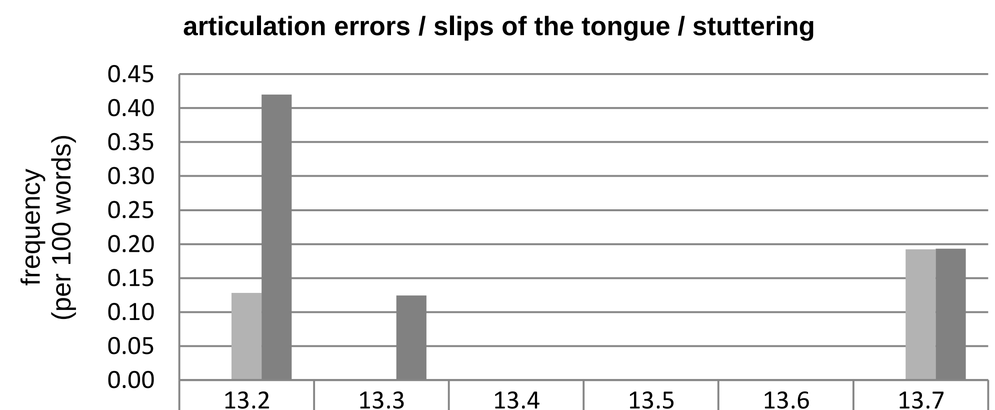
(32) *so he may have <bad> -- BANGED it on the back of the RIM that time*

13.5/2:23:40

(33) *Speedy CLAXTON mix- .. missed twenty games*

13.2/1:35:20

The sports commentary data contains 10 instances of articulation errors, slips of the tongue or stuttering and they are found in only three of the six individual transcripts. Figure 49 depicts the distribution in a way that allows for a speaker comparison and commentary type comparison at the same time. For each transcript 13.2-13.7 three columns are provided given that a value exists. In the first two columns (darkest and lightest grey) the frequencies of the play-by-play commentator is shown, first during visual event narration (PbP) and then during free speech (CC). The third columns indicates the frequencies of the designated color-commentator during free speech, which is the only commentary type he has access to.



	13.2	13.3	13.4	13.5	13.6	13.7
PbP in PbP	0.00	0.00	0.00	0.00	0.00	0.00
PbP in CC	0.13	0.00	0.00	0.00	0.00	0.19
CC	0.42	0.12	0.00	0.00	0.00	0.19

Figure 49 Disfluencies: frequencies of articulation errors / slips of the tongue / stuttering

First and second columns (darkest and lightest grey) = play-by-play commentator

Third column (middle tone grey) = color-commentator

The total number of discovered articulation errors, slips of the tongue or stuttering, suggesting that this speech quality indicator is not very common in sports commentary in general, is too low for any statistically significant observations. However, the few samples ones found are all within the color-commentary part of the data.

9.3.3 Self-corrections and substitutions

Another group of indicators for speech under high working memory load combines speaker self-corrections and substitutions. The distinction made here is that substitutions are interpreted according to Lindström et al. (2008) as a word or word sequence that is changed. Speaker Doc in (35) for example substitutes his already uttered *four point* by the correct *four second differential*, after he has realized the mistake. The term substitution for the current analysis refers therefore to an error in lexical selection. Only repairs that can be attributed to errors of identification, affecting the conceptualization of an event narration, were coded as self-correction. In (34) play-by-play commentator Mike for example wrongly identifies a defending player as *Kobe Bryant* and then stops for over two seconds before he introduces his correction formally with *excuse me* and provides the correct name of the player.

(34)*Kobe Bryant …(2.2) er excuse me Gary PAYTON was on Desmond Ferguson*

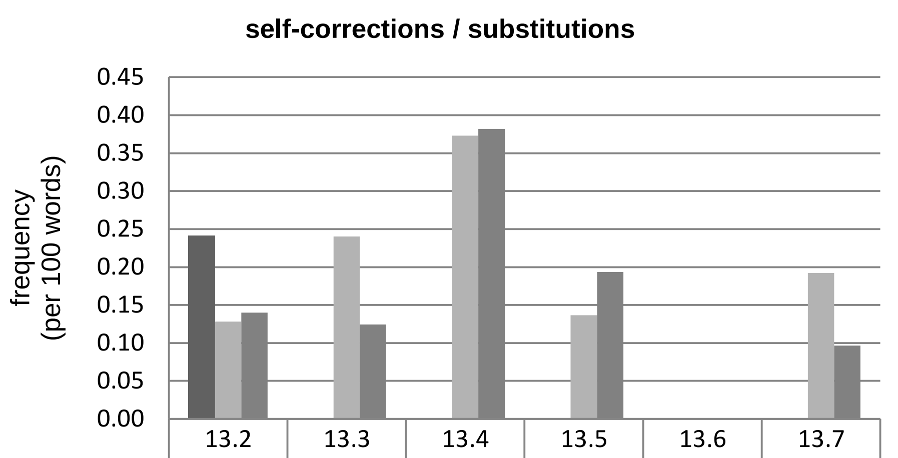
13.3/0:46:58

(35)*and just have a four point .. er ... a four second DIFFERENTIAL*

13.7/1:20:07

In the complete data there are sixteen self-corrections and substitutions in total, distributed over five of the six individual transcripts. Transcript 13.6 contains no instances of this group of symptoms, neither in play-by-play commentary nor in color-commentary. All results are visualized in Figure 50 with three columns per transcript number representing the three possible commentary scenarios.

The chart reveals that there is no visible tendency that can be attributed to speaker type. Both speakers apply self-corrections and substitutions, as seen in the second and third column of each data section. With respect to commentary type, however, we can see that except for 13.2 there are no values during visual event narrations. It is eye-catching that the play-by-play commentator in 13.2 shows a much higher frequency during visual event narrations than he himself during color-commentary and also a higher frequency than his color-commentator counterpart. It may surprise even more considering that it is the same commentator duo as in 13.4 where there are no values at all in the first column.



	13.2	13.3	13.4	13.5	13.6	13.7
PbP in PbP	0.24	0.00	0.00	0.00	0.00	0.00
PbP in CC	0.13	0.24	0.37	0.14	0.00	0.19
CC	0.14	0.12	0.38	0.19	0.00	0.10

Figure 50 Disfluencies: frequencies of self-corrections / substitutions
First and second columns (darkest and lightest grey) = play-by-play commentator
Third column (middle tone grey) = color-commentator

A conclusive statement in terms of the research hypothesis is therefore not possible with regards to self-corrections and substitutions, reflecting the ambiguous results already described in the review by Berthold and Jameson (1999), where two studies found an increased frequency under higher cognitive load, four studies found no change in behavior of the symptom, and one even reported a lower use of self-corrections.

9.3.4 False starts and deletions

In the literature these two terms are often used interchangeably (e.g. Lindström et al 2008), and a trend towards more false starts and deletions und working memory pressure is found. A coding of the sports commentary data has produced eighteen findings of false starts and deletions that could be split into two categories due to their nature. Some of the false starts are newly initiated sentences that maintain the general idea that was to be conveyed (37), while others appear to be complete abandonings of a proposition and a restart on a completely new thought (36).

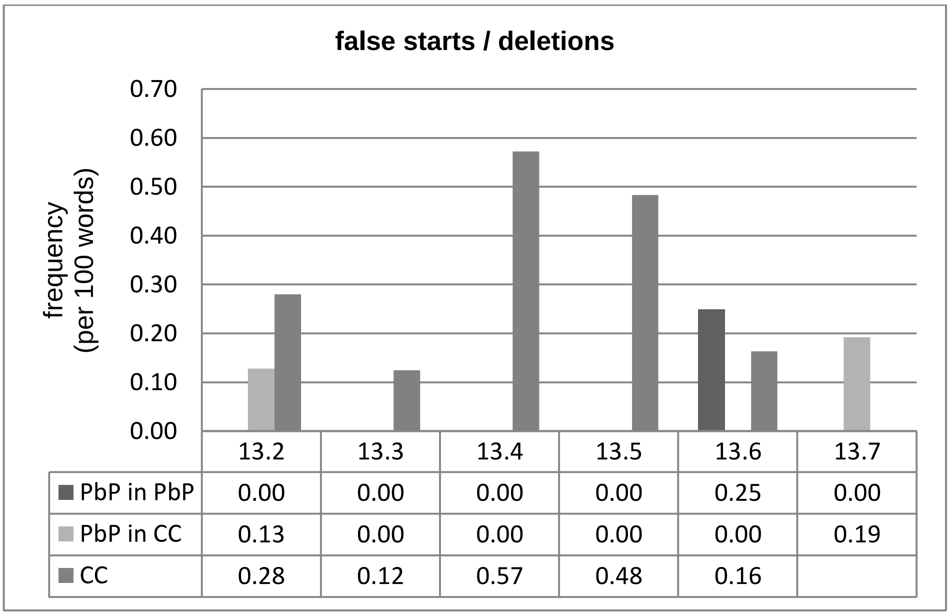
(36) *and when you -- .. again with the LAKERS*

13.5/2:14:37

(37) *... I don't .. NOT very many people pick and roll anymore*

13.2/1:45:36

The results visualized in graphs for each commentary scenario in Figure 51 show a similar overall result as the self-corrections and substitutions analysis (c.f. Figure 50). There is no clear pattern that would allow a conclusion based on the commentators themselves, as both the play-by-play commentators (13.2,13.6 and 13.7) and the color-commentators (in all transcripts) occasionally resort to deletions and false starts. While there appears to be no commentator role idiosyncrasies a focus on the commentary type again shows that all of the analyzed indicators occur during color commentary (although by both speakers), except for 13.6 where the frequency during visual event narration exceeds the frequency of the color commentator.



	13.2	13.3	13.4	13.5	13.6	13.7
PbP in PbP	0.00	0.00	0.00	0.00	0.25	0.00
PbP in CC	0.13	0.00	0.00	0.00	0.00	0.19
CC	0.28	0.12	0.57	0.48	0.16	

Figure 51 Disfluencies: frequencies of false starts / deletions
First and second columns (darkest and lightest grey) = play-by-play commentator
Third column (middle tone grey) = color-commentator

Similar to the previous sub-groups of disfluencies, the overall numbers of indicators may be too low to draw any conclusion for single symptoms with respect to the research hypothesis.

9.3.5 Repetitions

In section 9.3.2 on articulation errors, slips of the tongue and stuttering a definition of repetitions has been provided already because of the similarities with stuttering: only repetitions of phrases (38) or at least complete words (39) are coded.

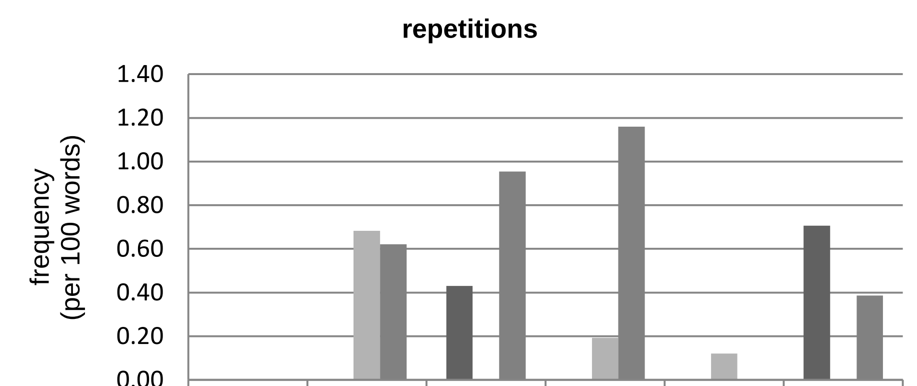
(38) *OBVIOUSLY Kobe knew about the record I mean I mean SOMEBODY must've been in his ear*

13.4/2:17

(39) *... so they .. they can attack you in areas*

13.5/2:14:37

Unlike for the previous three disfluency groups, a much higher number of repetitions were counted in the sports commentary data. Thirty-eight repetitions distributed across five of the six transcripts have resulted from the coding in MAXQDA10. Repetitions are a symptom of cognitive load in speech production that has shown a very clear tendency in the study collection of Berthold and Jameson (1999), with 5 of 6 studies measuring an increase under conditions of higher working memory demand.



	13.2	13.3	13.4	13.5	13.6	13.7
PbP in PbP	0.00	0.00	0.43	0.00	0.00	0.71
PbP in CC	0.00	0.68	0.00	0.19	0.12	0.00
CC	0.00	0.62	0.95	1.16	0.00	0.39

Figure 52 Disfluencies: frequencies of repetitions
First and second columns (darkest and lightest grey) = play-by-play commentator
Third column (middle tone grey) = color-commentator

The frequency presentation of the coding results in Figure 52 highlights that repetitions are not exclusive to a commentary type, with some indicators found in visual event narrations in 13.4 and 13.7. Nevertheless, except for 13.7, they are less frequently used during visual event narration than in the color-commentary scenarios.

9.3.6 Conclusion: disfluencies

The analysis of disfluencies was carried out in four parts. Several symptoms in speech production under high working memory load have been grouped for this purpose to ease coding of the sports commentary data. Even though the numbers of symptoms found for each sub-category are rather low to make a judgment based on a single indicator, some group results can be compared to previous studies.

No articulation errors, slips of the tongue or stuttering are found in the play-by-play commentary part of the data that provides the routine environment for formulaic language, for example. Language production has been proven vulnerable to disruptions of this group of cognitive load indicators under high working memory demand (c.f. Kemper et al. 2011:1). Rather an opposite trend can be observed in the sports commentary data.

A statistical analysis of self-corrections and substitutions has reflected the rather contradicting results of previous studies where the majority has not found any differences in distributional frequencies under increased working memory demand, because the individual transcripts differ very much: One suggests that play-by-play commentary features a higher frequency of self-corrections and substitutions, one does not include any of these characteristics, and the remaining four display a negative trend in frequency.

The third group focused on false starts and deletions, which were distributed across all six transcripts, but also with a clear tendency of a higher frequency during color-commentary than play-by-play commentary - in contradiction to the results from the literature review and in support of the research hypothesis.

Repetitions constituted the fourth and final group under investigation which according to Berthold and Jameson (1999) is one of the indicators with the most agreement on its behavior, namely an increasing frequency during higher working memory resources demand. This pattern could not be found in the majority of the transcripts (except for 13.7) and suggests that the nature of play-by-play commentary succeeds in lowering the overall demand on the limited pool of working memory resources.

These individual results are like pieces of a puzzle that form an overall picture of all disfluency phenomena. Taken together as one corpus instead of individual transcripts the elaborated overall tendencies allow for a comparison with the conclusions by Jameson et al. (2010) and Müller et al. (2001). All frequencies calculated for an entire category of disfluencies as well as a total are presented in Figure 53 for the cognitively more demanding visual event narration and the less working memory demanding non-visual event narration.

Every category result is in favor of the research hypothesis in that they show proportionally fewer indicators of speech under increased cognitive load. Even though the difference between frequencies in visual event narration and non-visual event narration are not always significant, one has to keep in mind that the all chosen indicators are actually supposed to increase in visual event narration. Even results at the same level would therefore already be considered as positive effects caused by the formulaic environment of play-by-play commentary.

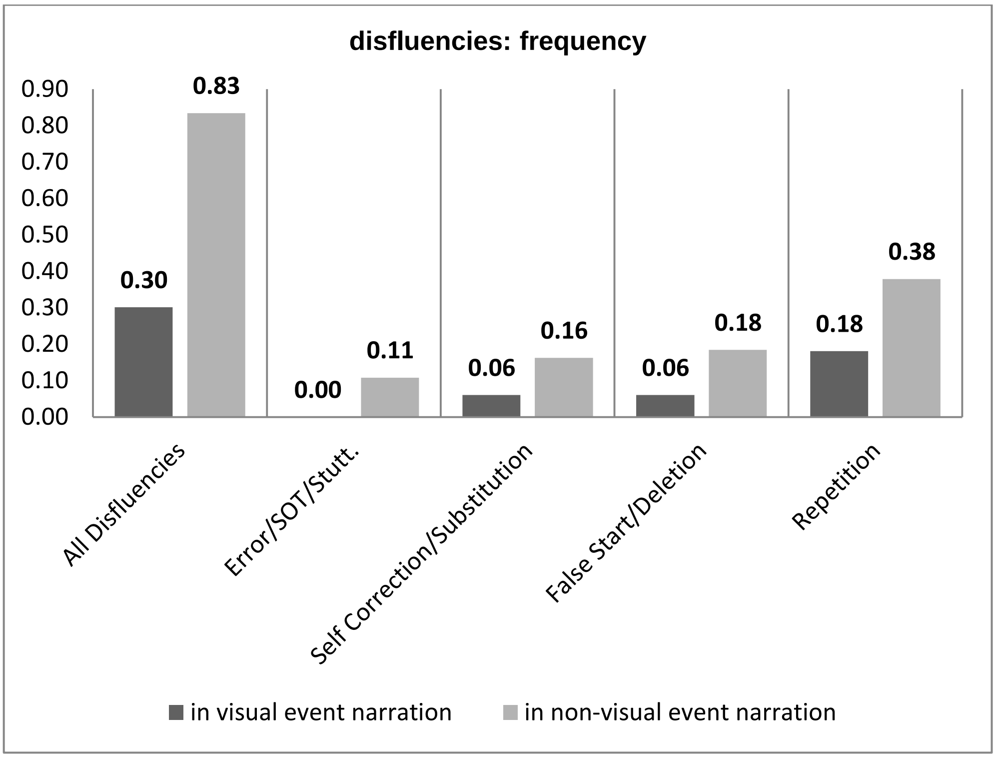


Figure 53 Disfluencies: overall frequency

In the first two columns, all disfluency results are taken together and set in relation to the amount of words spoken in each commentary type. The frequency of 0.83 per hundred words means that we encounter a disfluency phenomenon in color-commentary after approximately every 120th word in the corpus, whereas in play-by-play commentary this would be the case only after every 333rd spoken word. This corresponds to a factor of almost 2.8 times more disfluencies in color-commentary than in play-by-play commentary.

9.4 Output rate: speech rate

9.4.1 Definition and methodology

The calculation of speech rate is relatively time intensive. Essentially it is the quotient of "to be defined production units" per "to be defined time unit". Production units can be theoretically anything a text corpus can be broken down to, but syllables, words or propositions are the most frequent ones. For the sports commentary data the unit is defined as words, because the corpus is large enough to get comparable results without scaling further down. Time units are of course pre-defined, but depending on the intentions of a study they can range from very short intervals measured in milliseconds up to minutes. With respect to the selection of words as production units it is expedient to choose seconds as suitable time unit, because the generated results would by experience be straightforward values between 0 and 10.

Every utterance that has been coded as play-by-play commentary has to be measured individually. The same process is repeated for the control data of color-commentary, because it is not possible to simply subtract the play-by-play utterances from the total duration of the transcripts, as they include also introductory periods of silence where for example a TV station melody is played or, even more frequently, onset latencies between speaker turns that cannot be attributed to either commentary type.

These single utterance durations can be efficiently measured with the coding software MAXQDA10, if the data source is available on CD or DVD. Unfortunately, the original data medium for two of the televised sports events from which transcripts were produced is VHS. Therefore the analysis for speech rate is conducted only for the four transcripts (13.2, 13.3, 13.5, 13.7) that are available on DVD.

9.4.2 Expectation based on the research hypothesis

According to the literature there is broad agreement about how a speaker's speech rate changes when he or she is confronted with additional concurrent tasks. All seven studies by different authors reviewed in Jameson et al. (2010) have measured a lower overall speech rate of experimental subjects during a dual task (e.g. Lazarus-Mainka and Arnold 1987).

Visual event narration in sports commentary clearly is a dual task that increases the demand on working memory resources. However, based on the research hypothesis, the routine environment of play-by-play commentary that allows formulaic language to reduce working memory load of the speech production components could allow an equally high articulation rate as for color-commentary. An even higher speech rate compared to the control data of color-commentary is not expected, as the play-by-play commentary is always also dependent on the actual pace of the incoming events. Speech rate in visual event narration is in a sense limited to the "action rate" which is to be covered.

9.4.3 Speech rate results

All values measured for the calculation of the speech rates for each transcript are displayed in Table 18 and Table 19, for play-by-play commentary and color-commentary respectively. Speech blocks for color-commentary are significantly larger than for play-by-play, resulting in a proportionally very large control data set for the comparison.

Transcript	*Mode*	*Speech Block*	*Speech Block*	*Speech Rate*
		(words)	*(seconds)*	*(ratio)*
13.2	PbP	480	143.7	3.34
13.3	PbP	437	174.2	2.51
13.5	PbP	250	135.9	1.84
13.7	PbP	350	137.6	2.54

Table 18 Output rate: speech rate in play-by-play commentary
Speech block = all utterances coded as play-by-play (PbP) taken together
Ratio = quotient of words divided by seconds

Transcript	*Mode*	*Speech Block*	*Speech Block*	*Speech Rate*
		(words)	*(seconds)*	*(ratio)*
13.2	CC	1426	451.4	3.16
13.3	CC	1599	569.6	2.81
13.5	CC	2357	793.4	2.97
13.7	CC	2008	694.8	2.89

Table 19 Output rate: speech rate in color-commentary
Speech block = all utterances coded as color commentary (CC) taken together
Ratio = quotient of words divided by seconds

One striking discovery from the generated results is that speech rates in color-commentary are relatively stable, while there is much more variation in play-by-play commentary. The lowest value (2.81 words per second in 13.3) being only 0.35 apart from the highest calculated ratio (3.16 words per second in 13.2) provides a solid average value of the part of the sports commentary that does not include visual event narrations.

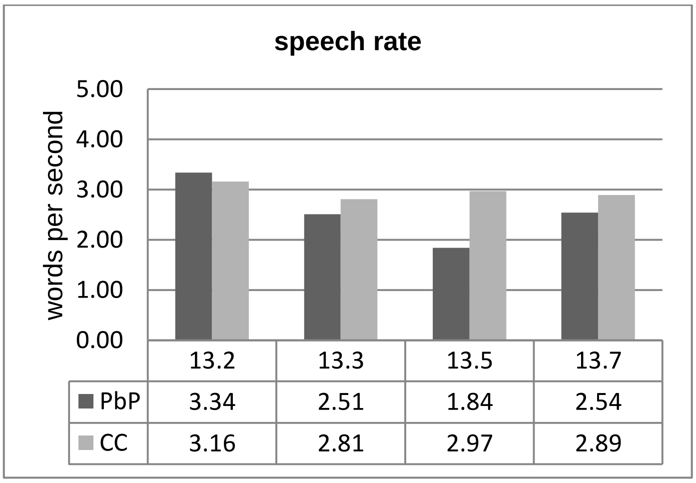


Figure 54 Output rate: speech rates for individual transcripts and commentary types

In speech rates for play-by-play commentary there is a rather large span of 1.5 words per second from the highest value (3.34 words per second in 13.2 to 1.84 words per second in 13.5). Better seen in Figure 54, the 3.34 ratio is exceptionally high in comparison to all other values of play-by-play commentary, but also exceeding all color-commentary speech rates . The general tendency however seems to be that speech rates in color commentary are higher on average than in play-by-play commentary.

9.4.4 Conclusion: speech rate

For an overall picture of speech rate in sports commentary, the results of each analyzed transcript are combined into one data corpus value in Figure 55. In color-commentary the average speech rate is faster by 0.38 words per second than in play-by-play commentary. This tendency is in accordance with the results from the literature review (Berthold and Jameson 1999) and the modeling replication by Müller et al. (2001).

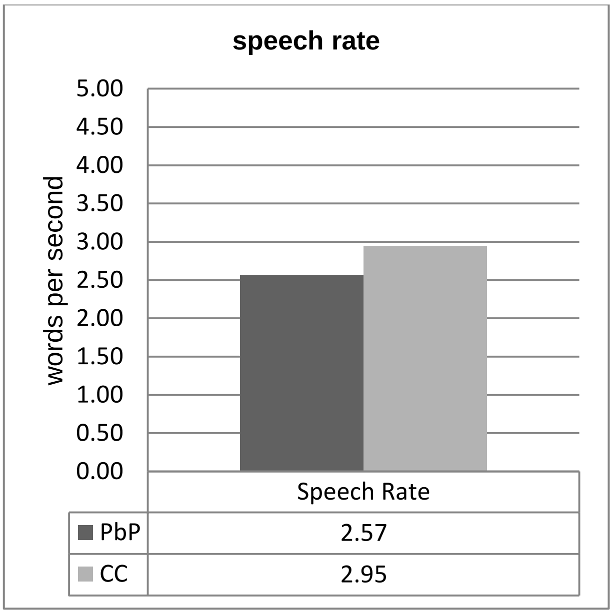


Figure 55 Output rate: overall speech rate per commentary type

Apparently, visual event narration, despite its formulaic routine environment, cannot be produced at an equally high rate as color-commentary that is not event-related or event-bound. There may be a direct link to the results of silent pausing, where play-by-play commentary showed a much higher count of long pauses (c.f. Figure 45). Since speech rate includes the duration of silent periods in the commentary for the ratio calculation the fact that the frequent long pauses as turn-taking signals play into the speech rate values must be taken into account. The next sub-chapter on articulation rate may allow for a better understanding of this argument.

9.5 Output rate: articulation rate

9.5.1 Definition and methodology

The determination of the actual articulation rate is in part based on the same formula as speech rate. In speech rate, however all silent pauses are included, which leads to a much longer overall duration. Articulation subtracts silent pauses and only measures the speed at which syllables or words are produced. A spelled out version of the formula for articulation rate would therefore be: the quotient of “to be defined production units” per “to be defined time unit minus time of silence”. Due to this dependency on identical values as for speech rate, the articulation rate analysis is also only conducted for the DVD version transcripts (13.2, 13.3, 13.5, 13.7).

For practical reasons production units as well as time units should be identical to the ones selected for speech rate. Only the additional values of the duration of silent pauses are required. In this case these values already exist from the section on silent pause durations in 9.1.4, and can simply be adopted.

9.5.2 Expectation based on the research hypothesis

An equally clear trend as for speech rate is found for articulation rate in the literature review. Also all seven investigated studies report a decrease in the articulation rate during high working memory load conditions. In most cases this might be a direct influence of the lower speech rate.

The sports commentary result expectation with the research hypothesis in mind is therefore also along the lines of the previously stated expectation for speech rate. It might be possible for play-by-play commentary with its formulaic framework to achieve an equally high articulation rate as color-commentary. An exceeding articulation rate in play-by-play commentary is not expected in comparison to the color-commentary control data, despite the intuitive perception of a high speed of the commentary described in the aim and scope of the research in 1.3 in the very beginning.

9.5.3 Articulation rate results

By definition, results for articulation rates have to be higher than for speech rates, since the number of production units as dividend remains identical while the subtraction of pause durations makes the divisor in the formula smaller.

In Table 20 and Table 21 the count of words per speech block (play-by-play or color-commentary) are displayed, the total duration of each speech block in seconds, the sum of all silent pause durations, and the articulation rate.

Transcript	*Mode*	*Speech Block*	*Speech Block*	*Pause Duration*	*Articulation Rate*
		(words)	*(seconds)*	*(seconds)*	*(ratio without pauses)*
13.2	PbP	480	143.7	31.80	4.29
13.3	PbP	437	174.2	74.80	4.40
13.5	PbP	250	135.9	67.95	3.68
13.7	PbP	350	137.6	64.55	4.79

Table 20 Output rate: articulation rate in play-by-play commentary
Speech block = all utterances coded as play-by-play (PbP) taken together
Ratio = quotient of words divided by seconds

Transcript	*Mode*	*Speech Block*	*Speech Block*	*Pause Duration*	*Articulation Rate*
		(words)	*(seconds)*	*(seconds)*	*(ratio without pauses)*
13.2	CC	1426	451.4	89.00	3.93
13.3	CC	1599	569.6	166.10	3.96
13.5	CC	2357	793.4	198.60	3.96
13.7	CC	2008	694.8	192.35	4.00

Table 21 Output rate: articulation rate in play-by-play commentary
Speech block = all utterances coded as color-commentary (CC) taken together
Ratio = quotient of words divided by seconds

Again, as for speech a rate, a remarkable stability is found in color-commentary, with the highest articulation rate (4.00 words/sec in 13.7) being only 0.07 words per second apart from the lowest value (3.93 words/sec in 13.2).

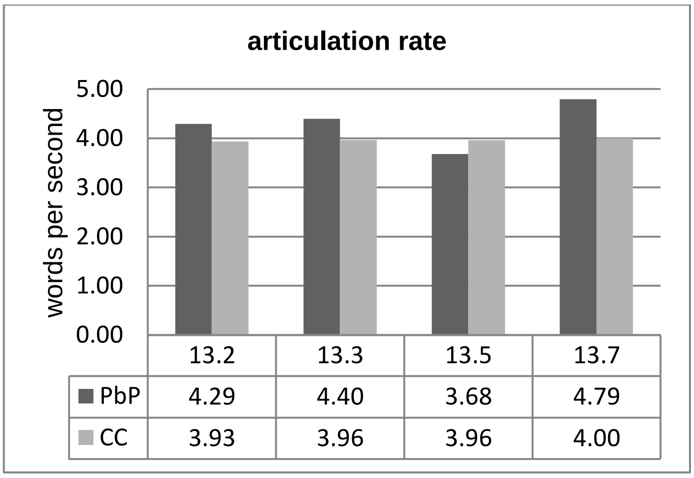


Figure 56 Output rate: articulation rates for individual transcripts and commentary types

The result visualization in Figure 56 shows that play-by-play commentary articulation rate has more variation with a maximum difference of 1.11 words per second from 13.5 to 13.7. Although this deviation is smaller than in speech rate, there are still considerable differences of articulation rates in the individual transcripts.

9.5.4 Conclusion: articulation rate

Leaving aside the idiosyncrasies of the individual transcripts, there is a clear tendency for a higher absolute articulation rate in play-by-play commentary, as depicted in Figure 57. In the complete analyzed data visual event narration achieves a production speed of 4.31 words per second, whereas color commentary stays short minimally below 4 words per second (3.97).

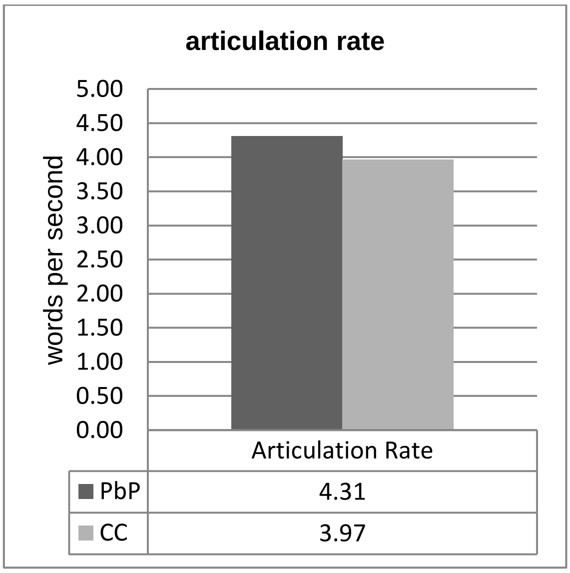


Figure 57 Output rate: overall articulation rate per commentary type

Delin (2000:43) has compared the articulation rate in her data of sports commentary with the speed of reading a book passage clearly and aloud. The average speed she has calculated was 191 words per minute, which corresponds to 3.18 words per second. Compared to this measure, the articulation rate of sports commentary is impressive.

Keeping in mind that both the speech production for reading out loud as well as for speaking freely as in color-commentary does not require some of the steps introduced in chapter 3 FROM VISUAL STIMULI TO SPOKEN WORDS, it is even more astonishing that play-by-play commentary can achieve such a high articulation rate. The observation is in favor of the research hypothesis, in that the nature of the language in play-by-play commentary seems to automatize language production in several of the mentioned steps from vision to word to an extent that the overall working memory load appears to be lower than in free speech, despite the dual task.

10 SPORTS COMMENTARY DATA CORPUS

10.1 Sports commentary as linguistic data

Live televised sports can be divided into two main categories: picture and sound. In the first category Raunsbjerg and Sand (1998) distinguish between the PHOTOGRAPHIC IMAGES, which show the actions of the respective sport that is covered, and GRAPHICS that include all kinds of statistical information visually presented to the audience, as well as commercial interludes and replay analyses. A similar distinction is made for the category of sound, which is divided into sounds that naturally occur at a sporting event and sounds of the commentary. The so-called WILD SOUNDS can be anything from the noises of the audience, the referee's whistle, a shout from a player to a teammate to music played at the stadium intended to motivate the crowd; even the squeaking sounds of shoes on the parquet of a basketball court are part of wild sounds. COMMENTARY, as a contrast, is an artificially verbalized coverage of a sporting event. Sports commentary can therefore be understood as the 'little something extra' to the wild sounds that graphics are to the photographic images, which both are provided by the television stations covering the sporting event.

Even though some sports aficionados bring their pocket-TV or radio to the stadiums, graphics and commentary are mainly designed and accessible for the television audience or, limited to audio, radio listeners who cannot attend the live event. On the level of the audience, a spectator following the game live at the event might be missing the instant replays or analyses provided on television, whereas the viewer of a televised sporting event can be missing the freedom to control his/her gaze and the in-stadium atmosphere. It is therefore one important task of sports commentary to make televised sports coverage a live event on its own – worthy to tune in. Hence, a sports commentator's job is twofold, as Kuiper and Austin (1990: 201) point out, being informers as well as entertainers.

Many linguists (e.g. Bowcher 2003 and 2004, Delin 2000, and Hoyle 1993) have characterized sports commentary as activity-tied language set in an institutionalized context. The fact that it is activity-tied lies in the nature of sports commentary, as it is expected to report on activities of a selected sports event. Even though commentators can freely choose their words, they are closely constrained as to the content of their utterances. Bowcher (2003) explains that sports commentary takes place in a non-negotiable, predetermined speech situation and introduces three categories to illustrate her claim: TENOR, FIELD and MODE. Tenor, which refers to the kind of participants involved in the situation and their respective roles and statuses, is predetermined and fixed well in advance. The notion of field describes the nature of the activity in which the language plays a role. Sports commentary as activity-tied language is very much constrained on its field and only rarely talks about things unrelated to the expected activities. Mode covers the channel of communication and type of contact between participants and the resulting feedback possible in the speech situation. Even though commentators, who mostly work in pairs, sometimes engage in dialogic talk with each other, sports commentary, and play-by-play commentary in particular, is essentially a type of monologue spoken to an unseen audience.

Kuiper and his associates have looked at sports commentary as ORAL FORMULAIC TRADITION similar to other varieties, such as aerobics instructor talk or the routine small talk at supermarket checkouts. Oral formulaic traditions, Kuiper and Austin (1990: 200) claim, are learned in three phases. The first phase is a period of listening only, followed by a period of apprenticeship. At the end of the second phase the speaker becomes fluent in the tradition and serves as "master" – a model for new listeners who will eventually adopt the tradition. This procedure applies very well to sports commentary, since no matter how professionalized sports commentary has become over the last decades, there is no formal training for commentators. Hyde (1991) repeatedly states that most commentators pick up the basics by simply listening to others and develop their idiosyncrasy using bits and pieces of those they admire most.

Television sports commentators of most team sports work in pairs. It is a convention to have one person, mostly a former sports journalist or radio announcer, doing PLAY-BY-PLAY commentaries and a second person, usually a former player, athlete or coach, providing COLOR-COMMENTARIES. Play-by-play comprises the fast-paced verbalization of the events happening live on court, in the rink, on the track, etc., whereas color-commentary is a more leisurely way of commenting on the action that has already passed, usually during short breaks or lulls in the sporting event.

10.1.1 Purpose of sports commentary

Each of the two types of commentary has a set of purposes. The color-commentator shares with the play-by-play commentator the task to bridge moments in a game that are not part of play-by-play events, or to fill emerging gaps in the commentary when actions have been considered not relevant enough to be reported on as play-by-play. In such cases, color-commentary tries to avoid a "threatening" hush in the coverage. Silence is undesirable for two reasons: first, it could convey the impression of incompetence to the audience, suggesting that the two commentators do not have enough background information or knowledge about the sporting event, and second, since it is sports commentary that marks televised sports coverage as different event from that at the stadium, the talk should be upheld at any point in time, in order to arouse the audience's enthusiasm for televised games.

Pawley (1991: 349) defines the main goal of a play-by-play commentator as "[communicating] to the [audience] the drama of the moment by calling the action as it happens, or as near as possible." This leaves play-by-play commentators with three important and almost simultaneous tasks. The first task is to constantly process the information about the game on which they are reporting. In a similar fashion as the television cameras in the stadium follow the ball or other action the commentator takes in as many impressions as possible in a photographic manner as well. What follows is the "editing of the recorded material" so to speak. The commentator's experience allows a reasonable sorting of relevant and less relevant information. Only actions that have eventually been considered pertinent will make it to the last task of "calling the action". This last phase of communicating the recorded and edited material aims at simultaneity to the task of processing the action. Even though Marriott (1997: 187) points out that every narrativization of an event must always be fundamentally retrospective, the extremely short delay between the action taking place and the verbal relaying of it justify that play-by-play commentary is sometimes termed SIMULTANEOUS ANNOUNCING.

Generally, play-by-play commentary can be broken into three objectives: why, what and when? The commentary is designed to provide information about the ongoing action to the audience. It reports pertinent information selected by the commentator and can by definition only occur while the game is running.

10.1.2 Manner of sports commentary

The purpose of the commentary also influences the manner in which it is produced. Pawley (1991: 356) argues that "the utterances by a commentator must not only make sense to the audience, they must entertain [and be] humorous where humour is called for, brief where brevity is called for, and so on." All these characteristics and the linguistic tools taken to achieve them depend on the choice of the commentator. In order to convey the drama of the live action taking place, for example, a commentator uses different means to achieve the objective. Pawley mentions that features of grammar, wording, intonation, volume and tempo are combined to build up a certain tension. The idiosyncratic choice and balance of the different linguistic tools by the speaker eventually gives quality not only to the commentary but also to the commentator.

Selectivity is another characteristic resulting from the above made claim that a commentator reports only on pertinent information. Even though the sorting between relevant and less relevant material depends on each commentator personally and on the unforeseeable events as they happen, it is important to be aware that in every basketball game the ball is the main object and the players the central figures of the event. One simplified rule for basketball commentary can therefore be described as: everything a player does with or to the ball is pertinent – irrespective of the quality. For the latter part or the rule, you will hardly ever hear a commentator praise a referee for passing the ball to a player waiting at the free-throw line, no matter how well he passes it. On the other hand you might likely hear a commentator calling every sort of shot towards the basket, no matter how bad the shot is. Hence, the quality of the action is no criterion for the selection. The main measure of pertinence is the visual image the audience can see on television. With the cameras following the ball throughout most of the running game and the commentator capturing impressions in a similar way as a camera does, the commentary naturally focuses around the ball and the players around it. Therefore, a dribbling, passing, shooting, deflecting or blocking of the ball by a player is very likely to be selected as relevant to report on.

Kuiper and Haggo (1985: 170) point out that even though play-by-play commentary tries to capture only relevant action, there will always enter some elements of more or less arbitrary selection into the final version of the commentary. This means that the commentary is not entirely driven by the external actions on court, no matter how focused it is on them, and that the commentator's personal selection of material makes the commentary not always isomorphic. A fully isomorphic commentary, in which the verbal commentary is of identical form to the visual events, is impossible because of the time constraint set by the play-by-play commentary's purpose of covering as many plays as possible without falling behind too much of the action.

The simultaneity of the play-by-play commentary to the live action on court results in what Bowcher (2003: 460) refers to as field-structured language constitutive activity, where the order of the actions taking place is mirrored in the order of the verbalized actions of the commentary. Play-by-play commentary is like a commented slide-show of pictures, in which the sequence of the verbalized images is predetermined by the sequence of the live actions.

10.1.3 Speaker-audience relationship in sports commentary

The institutionalized context in which both play-by-play and color-commentary are set results in an interesting speaker-audience relationship. Bowcher (2003: 459) states that whereas the commentators share a two-way aural and visual mode, the speakers and the audience are in a one-way aural mode only. Commentators can interact with each other verbally or with gestures, but neither can the commentators see the audience and vice versa - except for the few seconds traditionally held at the beginning of a coverage when the broadcast crew introduces itself on camera - nor is there a technical possibility for the television audience to give any sort of direct feedback.

The set up allows that commentators can address their partner with questions or remarks at almost any time. Despite the fact that a two-way communication is impossible, it is always desirable in sports commentary that the speakers produce their talk with the audience in mind. Therefore, it is not surprising that we occasionally find commentators addressing the audience. Based on the claim made by Marriott (1997: 186) that both parties share sufficient knowledge about the institutional context in which the televised sporting event is embedded, the direct addresses appear to be a feature of sports commentary intended to create or suggest intersubjectivity in the speaker-audience relationship.

10.2 Methodology and facts

The data used for the corpus of the research project are taken from basketball games of the American National Basketball Association NBA. All games were broadcast live between 2000 and 2004, and the data sources from which the transcripts were made, offer the recorded event as shown on television including pre-game shows, interviews, commercials, etc. A total of six games have been selected that were shown on five different television channels. One is the local network KGW TV8 of the Portland area in Oregon; the other four are the national broadcast stations Fox Sports Net, ABC, MSNBC Sports and TNT Turner Network Television. All stations feature their own commentators and as a result a total of five play-by-play commentators and five color-commentators contribute to the data.

Using a loop-enabling DVD player and a standard VCR player for two of the six transcripts, line after line have repeatedly been listened to with headphones and, with support of fact-sheets, statistics, player rosters and play-by-play descriptions available from the archive of the official NBA website, transcribed with partly modified transcription conventions by DuBois et al. (1992) as well as Edwards and Lampert (1993). Own conventions have been created to highlight characteristics of particular interest in the analysis of basketball commentary on live television. Transcription accuracy was ensured as best as possible by my own knowledge of most technical terms, idioms and expressions used in sports commentary on television, and, in particularly tricky cases, by the help of an English native-speaking friend who is also familiar with the language of sports commentary. Some limitations as to transcription accuracy are due to the audio quality on the DVDs. A loud crowd at the stadium can, for example, result in inaudible commentator sounds, or sometimes commentators simply do not speak clearly enough to allow reasonable transcription.

The complete data consists of six transcripts (13.2-13.7) covering a time span of 1 hour 7 minutes and 47 seconds in total, averaging roughly 11 minutes per chosen game. The extracts that were transcribed were chosen randomly out of the whole game - the only criterion being not too many commercial interruptions or time-outs, since the focus of research is not the organization of the television coverage but the language used in it. During 32 minutes and 55 seconds of the whole coverage the game is running, which means that almost during half of the time covered there are play-by-play commentaries possible. The other half automatically builds the comparative data.

In several chapters extracts from the transcripts are provided to demonstrate or elaborate the points under investigation. Each extract (always given in italics) is numbered to ease later reference in the text and also includes a source reference to the data corpus. The first number indicates in which transcript (13.2-13.7) the extract can be found while the second value refers to the starting time of a speaker's turn on the original media source (listed in the RT column for “real time” that is passed). This approach was taken instead of line numbering in the transcripts, because it allows the reader to get more spoken context of the utterances from the written transcripts or the media sources.

At times, the formatting of the extracts might differ from their original appearance in the data when given as numbered extracts in a chapter to ease readability and to single out those elements in focus. Generally, however, the transcription conventions presented in the following subchapter are kept to maintain their original character.

11 DISCUSSION AND CONCLUSION

11.1 Findings and implications

In order to interpret the findings of the current project and discuss their implications meaningfully, it is helpful to return to the two hypotheses stated in the beginning of this work. The first hypothesis concerned the assumption that working memory resources are limited and that there are situations and tasks for a speaker in which he or she can reach a state of working memory overload due to concurrent tasks that rely on working memory as well:

> *A constant flow of incoming visual stimuli that are to be segmented, structured, selected and then further processed for verbalization affects speech production negatively due to its high demand on the shared resource pool of working memory.*

Evidence for this hypothesis can be found in the first half of the thesis – the THEORETICAL FOUNDATIONS:

Chapter 3 explains that non-verbal input, in comparison to verbal input, requires more controlled processing steps. Combined with the evidence that dynamic domain descriptions (implied by the hypothesis wording "constant flow"), in comparison to static domain descriptions, also require additional processes during conceptualization, the case can be made that continuous visual event conceptualizations already demand a large amount of working memory resources. Additionally, the argument that vision only exists in "present tense" as fleeting memories implies that visual stimuli must be encoded as a long-term memory representation by means of the central executive and the focus of attention in order to be processed further for language, which taxes an even higher demand on working memory resources

Chapter 4 assesses the underlying precondition of the hypothesis that a "working memory overload" can occur. The general consensus found in a range of working memory models supports this claim. First of all, the human mind cannot focus on an unlimited amount of information concurrently (the FOA is limited in terms of information chunks), and second, long-term memory representations are not available for working memory for an unlimited duration or when too many interfering items are activated at the same time (WM is limited in terms of temporal decay of activation level and/or interference effects). Thus, there is a limit as to the amount of working memory resource demanding processes that can be carried out at once, and anything beyond this capacity constitutes a working memory overload which particularly in time-pressured speech tasks would necessarily lead to unsatisfactory results, or even failure.

A second hypothesis suggested that, under routine conditions, long-term memory solutions in the form of pre-fabricated speech formulas can avoid working memory overload:

> *If pre-fabricated speech formulas can increase speech production's dependence on long-term memory by bypassing working memory to a large extent, fewer resources will be demanded form working memory – thereby enabling a relatively fluent and effective verbal coverage of the visual stimuli under an increased working memory load.*

Evidence for this hypothesis can be found in the second half of the paper – the CORE ANALYSIS:

In order to corroborate this hypothesis a set of indicators of increased cognitive load in speech production was presented in chapter 7.3. These indicators that allow detection of cognitive load on the basis of speech served as basis for the comparative analysis between play-by-play commentary and color-commentary in the corpus result presentation of chapter 9. For every selected linguistic symptom, each backed by the majority of the reviewed literature and partly successfully implemented in models of automatic cognitive load detection (e.g. Jameson et al. 2010, Müller et al. 2001 and Berthold and Jameson 1999), a general tendency of behavior under increased cognitive load has been elaborated. A summary of these tendencies for non-formulaic free speech under conditions of increased working memory load is presented in the second column of Figure 58.

The methodical approach for the second hypothesis was to test each indicator as a variable in play-by-play commentary and color-commentary as comparative data. It was assumed that the formulaic framework and semi-productive speech formulas of play-by-play commentary can reduce working memory load to a degree that will change the behavior of the indicators of cognitive load. The suggestion was that a leveling of the tendencies from 7.3 would reflect a positive effect of pre-fabricated speech formulas in terms of working memory load already and a reversal in the tendencies would provide strong evidence for a significantly positive effect. In Figure 58 a summary of the tendencies in play-by-play commentary, the routinized and formulaic dual-task under investigation, is presented in the third column.

Silent pauses have yielded mixed results in the sense that the overall duration of silent pausing does not behave as anticipated (i.e. decrease in play-by-play commentary compared to color-commentary), whereas silent pause frequency shows a decrease in play-by-play commentary, as was expected according to the hypothesis.

Filled pauses were only analyzed for frequency, because in the literature there is no clear agreement for duration of filled pauses. In play-by-play commentary a decrease of filled pauses is visible in the almost zero distribution. Kuiper and Austin (1990:202) have made a similar observation in horse racing commentary and state that hesitations and fillers are absent in play-by-play commentary. Even though it is not completely the case, the general trend of the basketball data seems to get very close to their claim.

Disfluencies have turned out to be much less frequent in play-by-play commentary, which is in line with descriptions of sports commentary characteristics made by a number of authors. Kuiper and Austin for example explicitly looked at false-starts in sports commentary and also concluded that for the most part they are not present in play-by-play commentary. Four categories of disfluency phenomena have contributed to this overall picture, but each individual category showed a decrease of the indicator in play-by-play commentary (see Figure 53). It is therefore not simply a trend of the sum of all analyzed parts.

Similar to the analysis of pausing also the output rate, which was divided into a speech rate and an articulation rate analysis, have produced mixed results. While speech rate decreased in play-by-play commentary, as it would if it was non-formulaic, the articulation rate increases and surpasses the one of non-formulaic speech in color-commentary.

based on chapter 7.3		**based on chapter 9**	**conclusion**
indicator (symptom) of cognitive load	*When cognitive load is increased and the language remains **non-routine** and **unformulaic**, the tendency of the indicator is…*	*When cognitive load is increased but the language is **routine** and **formulaic** as in play-by-play commentary, the tendency of the indicator is…*	*Are the results of the corpus analysis in in support of the research hypothesis?*
pausing: silent pauses frequency	increase ↑	decrease ↓	yes
pausing: silent pauses duration	increase ↑	increase ↑	no
pausing: filled paused frequency	increase ↑	decrease ↓	yes
Output quality: Disfluencies	increase ↑	decrease ↓	yes
Output rate: Speech rate	decrease ↓	decrease ↓	no
Output rate: Articulation rate	decrease ↓	increase ↑	yes

Figure 58 Discussion and conclusion

Of the six individual analyses conducted in the sports commentary data four are in support of the second hypothesis stated above while two are not in favor of it. Interestingly, the two indicator behaviors that show a similar tendency despite the application of pre-fabricated speech formulas from long-term memory are intertwined. According to the statistics of the corpus analysis the overall duration of silent pauses cannot be reduced by formulaic language, which automatically influences the results of the speech rate indicator, because the formula to calculate speech rate includes the duration of silent pauses. It has been mentioned already in the conclusions of the respective symptom results that one factor rooted in the institutionalized manner of sports commentary on television could be mainly responsible for these results: long silent pauses as turn-taking signals (Delin 2000:48). Since play-by-play is the prioritized commentary type it must use signals that tell the commentary partner when he is allowed to take over for the so-called color commentaries.

With this explanation for the two results that do not immediately support the hypothesis in mind, the overall conclusion is that pre-fabricated speech formulas are long-term memory solutions to working memory overload in routine language.

11.2 Suggestions for further research

For the look ahead I will return to Sidney Lamb's quote in the very beginning of this paper. Even while showing an interest in the human mind, many linguists researching formulaic speech have not crossed the boundaries of pure corpus linguistics and stop short of going into more detail on their claims of processing benefits for working memory. The combination of corpus linguistics with findings from a range of different disciplines, however, can open new and interesting perspectives in understanding language and the mind. Lamb (1999:5) says that "the mind *can* be observed indirectly, through what it produces and how it makes us react when it receives things from the world and from parts of our bodies". To speak in Lamb's words, I believe that language is probably the best observable product of the brain - a response or reaction to stimuli perceived by our sense organs.

While the linguistic core analysis of the paper used a classic corpus analysis as method, the theoretical foundations were established by creating a synthesis of theories and models by authors from different fields of study. It would be of great value to continue work in an interdisciplinary fashion and to look beyond the traditional areas of linguistics. Structural imaging techniques, such as CAT, MRI, fMRI, rCBF or PET (c.f. Ingram 2007:60), for example, could produce new results for the research of language and memory in general and the relationship between pre-fabricated speech formulas and working memory in particular.

Therefore, I am convinced that linguistics could assume a bigger role as contributor to the study of the human mind than what it currently does, and that the true value of linguistics to related fields of research may not yet have been fully discovered. With this dissertational thesis I attempt to contribute something, although a small piece, to what is still niche and emerging trend at present but might well turn into a significant task of linguistics in the future.

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13 APPENDICES

13.1 Transcription conventions

For the transcription of the data a set of conventions relevant for linguistic aspects of sports commentary has been adopted from Du Bois (1992) as well as Edwards (1993) and modified where necessary, while other conventions for specific purposes have been invented. The goal was to create a corpus that is suitable for the analysis of a variety of linguistic features, not restricted to formulaic language in particular, because the assumption was that interesting aspects that would come up only during the project and analysis should be able to be tested immediately in the same corpus without refinement of the transcripts. A description of the symbols and conventions used is provided below:

RT	REAL TIME Column indicating the real time that elapsed during the extract covering the game. The numbers are taken from the DVD device used for the transcription. RT serves as reader help to ease finding references within the transcript and on the DVD used as source.
GT	GAME TIME Column indicating the game time that elapsed during the extract covering the game. The numbers are taken from the official game clock displayed in the coverage of the game. GT helps to identify where the game is under way, when plays are not visible on screen.
NAME:	SPEAKER'S NAME IN THE SPEAKER (SP) COLUMN Column identifying the speaker of a given turn. Since all speakers are professionals and aware of the fact that they were being recorded their real names are used.
[it's] or [[it's]]	SPEECH OVERLAP Utterances enclosed in single or double square brackets indicate speech overlap, and where this begins and/or ends. Overlap locations are realigned visually if possible.
@	LAUGHTER Each symbol indicating one syllable.

X — INDECIPHERABLE SYLLABLE

The capital letter X indicating one syllable of speech that does not allow reasonable guess at what was said.

<it's> — FALSE STARTS

Plain angle brackets are used to enclose words which are false starts.

- — TRUNCATION

A single hyphen symbolizes that the speaker is leaving the end of the projected word unuttered.

-- — TRUNCATED INTONATION UNITS

The double hyphen symbolizes that the speaker abandons the projected intonation unit before finishing it - i.e. in false starts.

<X it's X> — UNCERTAIN HEARING

A pair of angle brackets marked with the letter X indicates portions of the text which are not clearly audible to the transcriber but allow reasonable transcription.

i::t's — EXTENDED OR PROLONGED SOUNDS

Colons indicate that sounds are prolonged beyond their normal length. Each colon represents approximately the length of a syllable.

? — APPEAL

A question tag marks a class of intonation contours whose transitional continuity is understood as an appeal. It is however not used for a grammatical question uttered with intonations other than the appeal contour.

...(2.7) — LONG PAUSE (0.7 seconds or longer, as indicated by the number)

Three dots immediately followed by a number in single parentheses are used to represent relatively long pauses. The approximate duration is indicated within parentheses to the nearest tenth of a second.

... — MEDIUM PAUSE (between 0.3 to 0.6 seconds)

Three dots indicate a noticeable, but not very long pause.

.. SHORT PAUSE (about 0.2 seconds or less)

Two dots indicate a brief break in speech rhythm, that is, a very short, barely perceptible pause.

(0) LATCHING

A zero within single parentheses indicates that the following utterance "latches" onto the preceding utterance, that is, there is no pause between the two speakers' turns.

CAPITALS SPECIAL EMPHASIS

Capital letters indicate special volume or emphasis on the capitalized element.

bold GAME RUNNING

All elements in bold are uttered while the game is running.

<u>underlined</u> REPLAYS AND GRAPHICS

All underlined elements are uttered while there are either replays or a graphics with statistical information visible on the screen to which the speaker might refer to. Aligned to the right, either *rep* or *stat* in italics indicates whether replays or statistics are shown.

13.2 Transcript: Golden State Warriors @ L.A. Lakers on FOX SPORTS Net

NBA Game: **Golden State Warriors (GSW) @ Los Angeles Lakers (LAL)**
Date: **4/13/2004**
Location: **STAPLES Center, Los Angeles, CA**

Filename: <GSW at LAL on Fox Sports Net> DVD Code: J2175
Network: FOX SPORTS Net
Speakers (**SP**): **Paul** Sunderland; play-by-play
Stu Lantz; color-commentaries

Transcript begins after a GSW team timeout: Game time @ 6:06 in the 3rd Qtr. DVD Scene: 17 @ 1:34:06
Transcript ends at the end of the 3rd Qtr.: Game time @ 0:00 in the 3rd Qtr. DVD Scene: 19 @ 1:47:07

Time elapsed: Real time (**RT**): 10 min. 32 secs. (2min. 29 secs. commercial breaks excluded)
Game time (**GT**): 06 min. 06 secs.

RT	GT	SP		
1:34:06	6:06	PAUL:	the Lakers thirty three and SEVEN here at staples center fifty four and twenty six overall .. CURRENTLY ... the fourth seat in the western conference Sacramento in the second spot .. San Antonio ... in the third .. as the Lakers come back out on the floor .. **TRAILING ... the Golden State Warriors sixty eight .. sixty**	
1:34:23	6:04	STU:	**... that last basket .. on the bounce passed it .. Karl gave Kobe ...(0.8) that was Karl's FIRST ...(1.0) assist ...(0.8) FIRST ... seems like he's got three .. four .. five of those**	
1:34:32	5:55	PAUL:	**... Stu I had exactly the same thought because when .. he delivered that PASS ... I INSTINCTIVELY said as Mike Dunleavy makes an eighteen footer I said .. ANOTHER assist for Karl Malone ... I don't mean another one this SEASON .. I meant another one TONIGHT ... and I looked over there and he's been officially credited with just one ...(2.1) Malone had FOUR assists on Sunday at Sacramento ..** Kobe gets DOWN in the lane ... the blocking foul is called on Mike Dunleavy ... or Mickael Pietrus I think they'll give it to Dunleavy and Kobe'll get back to the LINE for the first time .. IN the second half .. he was a perfect SIX FOR SIX ... in the first	
1:35:03	5:37	STU:	<u>... a nice cut OFF .. of MALONE and the return pass .. and</u>	*rep*

			Dunleavy trying to take the charge .. he took the CHARGE alright ... COMPLETELY under the BASKET there ... and er .. picked up the BLOCKING foul .. for Kobe ... to shoot TWO .. with the Warriors STILL UP ...(0.9) by TEN
1:35:20	5:37	PAUL:	...(2.3) the Warriors were THIRTY eight and FORTY four last season and had HIGH HOPES this year for CHALLENGING ... for a playoff SPOT ... but the early season even PRESEASON injuries Eric Musselman looks ON and ... in a conversation with ... Gary Payton ...(1.1) **Gary Payton a very NOTED conversation er last FRIDAY with ... Hubie Brown .. of the ...(1.2) Memphis Grizzlies ... and Troy MURPHY went down .. and Nick Van EXEL went DOWN and ...(0.9) Speedy CLAXTON mix- .. missed twenty games …(1.6) ROLL DOWN the lane** and ADONAL Foyle ... TOUGH CHANCE .. but er ... would've been a good opportunity and a nice try by Dunleavy
1:35:57	5:21	STU:	...(1.0) huh .. Dunleavy ran into point situation there I er said it at the beginning of the game .. er ... **if you CAN ... you've gotta make Dunleavy .. turn his BACK ... to protect the basketball .. if you got him FACE YOU UP ... because of his SIZE ... he SEES .. EVERYTHING**
1:36:11	5:12	PAUL:	**...(1.0) Devean George still looking for his first basket .. he's o- for a three GARY Payton a hot hand in the second half little HEAT check ... off the front of the ARM ... PASS ahead for the LAKERS were SLOW getting back of RICHARDSON was out there for a LONG time ... (0.8) Dunleavy with it Richardson frees himself working on PAYTON ...(1.5) Richardson wants to BACK him down .. PAYTON holding his GROUND .. SHAQ comes over to HELP ... GOOD job change** in the shot Richardson deflects it away from KOBE ... the Lakers will have the ball for .. FIFTY remaining in the THIRD
1:36:37	4:50	STU:	... Shaq and Gary defensively did what you wanna do ... make an offensive guy .. ALTER his shot .. er <he> -- ... Jason Richardson altered it **SO much ...(0.7) it was nothing but AIR**
1:36:49	4:47	PAUL:	**...(1.2) Richardson so far on tonight ...(0.9) has eleven points ... but on X of twelve SHOOTING ...(0.8) Shaq out**

			on the perimeter .. coming to Devean George .. DEVEAN ...(1.2) LOOKS uncomfortable out there tonight Stu mentioned earlier that he was limpin his way up the FLOOR .. but er ... pretty ineffective SO far shot clock down to five and an OFFENSIVE FOUL is called against Devean	
1:37:13	4:30	STU:	...(4.8) that's one of the reasons why he looks uncomfortable he's not having .. any .. success .. as he just BOWLS OVER .. er @@Dunleavy ... there's a case where ... the defender **was NOT in FRONT of the offensive player .. but because the offensive player used the SHOULDER and ARM ... to push OFF ... you pick UP ... the offensive FOUL**	*rep*
1:37:30	4:21	PAUL:	**...(1.2) Rick Fox .. sitting on the sideline a STIFF BLACK PLASTIC SPLINT on his RIGHT THUMB ...(1.0) Robinson goes down the lane NICE STRIP by MALONE ...(1.1) you could hear that all the way up HERE ...(0.8) ALL basketball .. Kobe spins down the lane .. NICE PASS to Malone .. FALL away jumper ... THEY'LL .. GET the assist to Kobe BRYANT**	
1:37:48	4:03	STU:	**... nice job of stripping the ball by the MAILMAN .. er ... Clifford Robinson ... EXPOSED it EARLY ... @ the @mailman ... TOOK it away**	
1:37:57	3:55	PAUL:	**... Malone now with eight to finish the thought on Rick Fox .. Dewey told me ... they were gonna experiment with different SPLINTS** ... but right NOW ... Rick's IDEA is to ju- to TAPE up that thumb as best he CAN .. because he don't think in .. any WAY he could play at ALL ... with a SPLINT ... he has TRIED it ... he's tried to SHOOT the ball to ... NO EFFECT whatsoever .. so he just gonna tape it up .. and play as best as he CAN	
1:38:18	3:49	STU:	...(1.4) er .. is gonna be difficult to do .. because the thumb IS very important .. that last basket **by Karl Malone .. nice assist by Kobe ... that's a goo- good DEFENSE**	*rep*
1:38:26	3:44	PAUL:	**... Shaq coming OVER ... oh .. and PIETRUS GOT a BOUNCE ... GOOD looking play by the rookie**	
1:38:32	3:38	STU:	**...(1.7) we talked about al- .. altering the shot .. but still having SUCCESS .. Shaq made him fill THAT one up to the top of the GLASS .. but ... it went home**	

1:38:39	3:31	PAUL:	**... I'm not sure Pietrus ever saw the TARGET when Shaquille O'Neal came OVER ...(0.9) Kobe with it ... Robinson there .. gettin ready to help ... comes around the screen by Malone .. pull up seventeen footer needs a bounce knock there ... rebound taken by FOYLE ... Lakers trail at SEVENTY two to SIXTY three ... Dunleavy ..** nobody STOPS [the ball]	
1:38:57	3:15	STU:	[goaltending]	
1:38:57	3:15	PAUL:	... is that gonna be GOALTENDING on Kobe?	
1:38:59	3:15	STU:	... yeah	
1:39:00	3:15	PAUL:	... COUNT THE BASKET ... (0.8) and a FOUL on the PLAY as Dunleavy will look to complete the three point PLAY	
1:39:05	3:15	STU:	...(0.9) get the FOUL on Gary Payton and the goaltend ... ON KOBE is mu- .. er Dunleavy does a GREAT job of pushing it down in a HURRY er ... Kobe up at the very very TOP ...(0.8) to block THAT one ... they call GOALTENDING .. so three point opportunity coming ... to Dunleavy	*rep*
1:39:22	3:15	PAUL:	...(0.9) Mike Dunleavy if you don't **follow the NBA .. the SON .. of Mike Dunleavy .. SENIOR ... headcoach of the Clippers ... the Lakers fall asleep on the free throw and the ball comes RIGHT back OUT ... to the WARRIORS ...(0.8) Richardson picked up by SHAQUILLE ... he wanna go back to Richardson .. Shaq comes out ON it ... does a good job of staying in FRONT ... out to Dunleavy ... GOOD defense by the Lakers .. the ball's knocked free ... and the Lakers will take it on the TURNOVER**	
1:39:45	2:54	STU:	**...(0.8) it was a TERRIBLE job that time was taken advantage of the situation .. where they had .. SHAQ OUT guarding Jason Richardson .. they FOILED that one .. COMPLETE**	
1:39:54	2:45	PAUL:	**...(1.2) Kobe got a GOOD screen from Shaquille ... OUT to Payton once AGAIN ... headfake .. ROLLS down the lane all the way to the basket for the layup**	
1:40:00	2:38	STU:	**...(1.2) well Gary RAN off the three POINT line that TIME .. and gets himself a LAYUP .. NICE JOB of recognition ... by GP**	
1:40:08	2:31	PAUL:	**... Gary Payton havin a NICE third period ... after he had only ... TWO points ...(0.7) in the first half ... SEVEN now**	

			... in the PERIOD ... and that's a three second violation ... at the DEFENSIVE end ... CALLED against the Lakers ... Shaquille O'Neal ... TECHNICAL foul .. when we come back	
1:40:25	2:23	STU:	...(1.3) yup ... that means somebody will be shooting a FREE throw and they'll be shooting it from the WARRIORS ... on FOX .. SPORTS .. NET ...(3.0)	
1:40:35	TO	1:42:14	((COMMERCIAL BREAK – LAL TEAM TIMEOUT: REGULAR))	
1:42:14	TO	1:43:04	((IN-STADIUM CELEBRITY INTERVIEW BY BILL MACDONALD WITH PRO-BOXER SUGAR SHANE MOSLEY))	
1:43:04	2:23	PAUL:	the Lakers could use a little PUNCH .. there's no question about THAT as Cliff Robinson comes out of the timeout after the technical FOUL ... with the .. three seconds in the lane .. illegally on Shaquille O'Neal with the defensive END ... so the Lakers trail it ... BY TEN ONCE AGAIN .. the LARGEST deficit ... the Lakers have faced .. **is SIXTEEN ... they have NEVER LED ... in this GAME ... well ahead of that time for you're remembering back to SUNDAY .. the never led against SACRAMENTO ... DUNLEAVY on the dribble pulls up comes way short .. Kobe out on the grain ... Dunleavy back ... Kobe SHAKES ... SPLITS THE DEFENDANTS OH what a SHOT by KOBE**	
1:43:39	2:05	STU:	**...(1.1) well you're right in FRONT of him and you think .. woah there's TWO of us here .. we've GOT him ... make him take .. what was THAT .. you say to yourself ... THAT SHOT went IN? ... yeah that's Kobe BRYANT for you**	
1:43:48	1:56	PAUL:	**(0) and Mike Dunleavy .. at SIX nine ... and a pretty SMART player ... pretty good BASKETBALL player ... and Kobe just went right TROUGH him** ... oh HE'S outta bounds ... Adonal Foyle was outta bounds .. Cliff Robinson FOUND him .. I guess he was OPEN .. @cuz @there's ... no reaons in defending anybody down THERE	*rep*
1:44:03	1:49	STU:	(0) that last basket by **Kobe .. TWO defendants there and he just goes er .. up between them and .. nice spin on the**	

			ball .. nice english ... it just ...CRADLES itself ... RIGHT ... TO ...(1.0) the BASKET	
1:44:14	1:38	PAUL:	**... eleven turnovers now for the Warriors .. who turned it over only three times ...(0.8) in the first HALF ...(1.4) SHAQ ... DOWN INSIDE ... AROUND Adonal FOYLE ... boy Adonal took a SHOT there at SHAQ ... after he was out of the play .. rolled STRAIGHT to the hoop**	
1:44:30	1:23	STU:	**... yeah Adonal Foyle is a very .. BRIGHT young man .. and er .. he knows you can't LEAD with your HEAD ... against Shaquille**	
1:44:36	1:16	PAUL:	**... Shaq now with thirteen** ... seven rebounds .. three assists .. and Devean George ... called for the holding foul .. against Mike Dunleavy	
1:44:47	1:16	STU:	...(3.5) the last basket by Shaquille is .. Adonal Foyle trying to hold his position and ... all of a sudden he said OOH .. no .. no [ya]	*rep*
1:44:53	1:16	PAUL:	[wow]	
1:44:53	1:16	STU:	(0) ya .. I'll give this HOOP UP ... I'm [[not gonna take ... ANY MORE of]]	
1:44:55	1:16	PAUL:	[[@@@@]]	
1:44:56	1:16	STU:	(0) this ABUSE	
1:45:00	1:14	PAUL:	**...(3.2) Robinson with it .. with fourteen ... Pietrus leading the way with EIGHTEEN ...(1.1) behind the back pass out to Dunleavy .. five on the shot clock .. PIETRUS on the way no Shaq skies for the rebound ...(0.8) to the hands snapped basket ... MALONE'S open ... HE'S AVAILABLE** and THROWS down the lob .. THE LAKERS TRAIL IT by four	
1:45:17	1:00	STU:	... that's the first time this YEAR **I think I've seen Malone on front in of a LOB PLAY but ... Gary Payton SPOTTED him and ... the Lakers make it happen**	
1:45:26	0:52	PAUL:	**...(1.3) six o run by the Lakers ...(1.2) Lakers gotta put more pressure on Dunleavy .. Malone comes out to help ... ROBINSON with a LONG** three pointer .. answers the run by Lakers	
1:45:36	0:45	STU:	...(1.2) PIT .. and .. POP ... **I don't .. NOT very many people pick and roll anymore .. they just .. ALL like to sell off with that JUMP SHOT and ... they do it quite EFFECTIVELY**	

1:45:45	0:37	PAUL:	**... Robinson now with seventeen ... Shaq with it .. the hand off to Kobe ... Kobe ... gets down in the lane .. NICE PASS out to Payton thought about the three .. rolls down the lane ... difficult .. OH:::: ...** SHAQ HAMMERED IT HOME ... IN **TRAFFIC**	
1:46:01	0:25	STU:	**...(1.3)** @@@**[**@@@**]**	
1:46:02	0:24	PAUL:	**[HOW DID HE DO] THAT**	
1:46:04	0:22	STU:	**...(1.1) ah:: ... the big fella said if I get a f- .. free er .. PATH to jump ... maybe I can get me an offensive REBOUNDING ... offensive REBOUND ... he SECURED**	
1:46:13	0:13	PAUL:	**... Lakers trail it BY FIVE ... shot clock at eight ... game clock down to ten**	
1:46:18	0:08	STU:	**...(0.8) now you don't wanna foul here ... maybe make them make a tough shot .. to end the quarter don't put them on the line**	
1:46:23	0:03	PAUL:	**... Dunleavy ATTACKS ... misses THAT ... the Lakers are gonna get a LOOK at** it ... KOBE from sixty feet off the TOP of the BOARD ...(1.1) boy that play by Shaquille O'Neal ... certainly IGNITED this crowd ... we'll see if it ignites the Lakers .. for the final period	*rep*
1:46:37	0:00	STU:	(0) a great job of anticipation and TIMING by Shaquille .. as he goes UP ... ACTUALLY that should @PROBABLY be NEGATED as there was a ... Kobe BRYANT ... BIG RIGHT HAND ... HOLDING ON ...(0.8) TO THE RIM ... but the Lakers will TAKE it ... as they TRAIL .. BY FIVE ... ENTERING ... the FOURTH quarter on an eight to two run the last two twenty three of the third ... what kind of a FOURTH ... will we have .. and we'll see it ALL ... on FOX ... SPORTS Net ...(5.4)	*rep*
1:47:07	0:00		((COMMERCIAL BREAK - END OF THE THIRD QUARTER))	

13.3 Transcript: L.A. Lakers @ Portland Trailblazers on KGW-TV 8

NBA Game: **Los Angeles Lakers (LAL) @ Portland Trailblazers (POR)**
Date: **4/14/2004**
Location: **Rose Garden, Portland, OR**

Filename: <LAL at POR on KGW TV 8> DVD Code: J2187
Network: KGW-TV 8 (Blazers Television Network)
Speakers (**SP**): **Mike** Barrett; play-by-play
Steve Jones; color-commentaries

Transcript begins after an official timeout: Game time @ 8:21 in the 2nd Qtr. DVD Scene: 07 @ 0:40:39
Transcript ends at the end of the 2nd Qtr.: Game time @ 0:00 in the 2nd Qtr. DVD Scene: 11 @ 0:58:42

Time elapsed: Real time (**RT**): 13 min. 49 secs. (4 min. 14 secs. commercial breaks excluded)
Game time (**GT**): 08 min. 21 secs.

RT	GT	SP	
0:40:39	8:21	MIKE:	Desmond FERGUSON ... checks into the ballgame for Portland .. so
0:40:45	8:21	STEVE:	**...(2.0) now Kobe Bryant back in the ballgame <he'll> -- ... he will join er ...(1.1) Kareem Rush Sha- .. quille O'Neal ... Slava Medvedenko and Derek Fisher ...(0.9) <Stoud> -- ... Stoudamire back in and he will lead Portland with TEN ... with Rahim Davis ... Ferguson and Outlaw**
0:41:03	8:03	MIKE:	**...(2.7) they drop it down low to Abdur Rahim Shaq comes to HELP ... here's Outlaw AGAIN is ... this was a little bit short on TOP**
0:41:14	7:52	STEVE:	**...(4.4) he's got lotta SHOTS in him and HE'S got a lot of shots in him and then .. you know this is ... this is a LONG time coming for him ... and this is like an opening night DEBUT for him**
0:41:24	7:42	MIKE:	**...(1.5) Kobe trying to shake Des FERGUSON .. to kick it on top to FISHER .. now Kareem RUSH has it for THREE ... Rush is SHORT with it ... Damon tips the rebound to Abdur RAHIM as ... Ruben PATTERSON and Theo RATLIFF will check in next WHISTLE first minutes for Patterson in THIS one ...(3.8) Damon .. nice spin move and gets the move against FISHER ...(2.3) Shareef ...(1.3) Dale DAVIS is up pull it from eighteen and this is SHORT**

			but follows his own SHOT and keeps it alive and ... tips it off of MEDVEDENKO who disagrees ...(3.4) Travis Outlaw will SIT down ...(2.3) and Dale DAVIS will sit down ... Patterson and ... Theo Ratliff in the GAME ...(1.1) Outlaw gets a nice HAND ...(5.6) Outlaw was playing **HIGHSCHOOL basketball this time last YEAR ...(4.1) he had just FINISHED his highschool career I should say here STOUDAMIRE ... finds it open RATLIFF ... THEO ... takes the ten FOOTER and hits**	
0:42:28	7:02	STEVE:	**...(2.7) coming up TONIGHT ... for the first time all season Ratliff we've seen that jumper go IN a couple times ... he's .. CAPABLE of MAKING that shot and ... if HE improves and gets that shot DOWN that's a .. HUGE plus for the Trailblazers ... in the coming SEASON ...(2. 0) [Shaq]**	
0:42:42	6:47	MIKE:	**[Shaq] down [[low]] er**	
0:42:43	6:46	STEVE:	**[[XX]]**	
0:42:44	6:45	MIKE:	**... yeah**	
0:42:44	6:45	STEVE:	**... again ... the big problem for Theo .. in handling Shaq is .. he's just too BIG and if you can't get him out of that PAINT ... he's gonna wear you out**	
0:42:52	6:37	MIKE:	**...(0.8) Shaq .. the first Laker in the double figures with TEN ...(1.5) here's Desmond Ferguson off the pick .. they give it back to Rahim ...(4.3)** Shareef ...(2.2) OFFENSIVE foul called on .. Shareef Abdur Rahim .. so just as we say he got his ... FIRST CALL .. in a Blazer uniform moments AGO ...(1.1) Bob Delaney makes the offensive FOUL call as ...(1.2) holy cow	*rep*
0:43:18	6:27	STEVE:	... er ... BACK it in ... KNOCKS the arm off .. which you're NOT supposed to do ... and er ... will get it BACK .. and come back AGAIN ... so ... he GOT away with it the first time **but the SECOND time he got CAUGHT ...(1.2) and he -- ... Shareef is MUCH BETTER ... when he turns and faces er .. and makes a decision to go either left or right**	
0:43:39	6:15	MIKE:	**...(2.1) Medvedenko down the middle all the way INSIDE is ...(0.8) Shaq was affected certainly by the presence of Theo Ratliff he gets it BACK ...(3.6) Kobe ...(1.3) Patterson on HIM ...(2.7) Shaq on the right block just tries**	

			to power his way THROUGH Ratliff and puts it up and IN	
0:43:59	5:55	STEVE:	**...(1.9) you don't see that lefthander often with Shaq .. but he er .. showed it there he DOES have it ...(2.3) FOUR POINT** GAME and er .. Portland wants a timeout	
0:44:10	5:48	MIKE:	...(2.0) five forty eight left here in the first HALF .. LAKERS ... coming BACK ... behind the BIG guy ... on the Blazers Television Network ...(3.7)	
0:44:20	TO	0:46:40	((COMMERCIAL BREAK – POR TEAM TIMEOUT: REGULAR))	
0:46:41	5:48	STEVE:	**Patterson ...(1.1) Ferguson ... Rahim ... Ratliff and ... Stoudamire .. <the> -- <the> -- the lineups have been changing almost on EVERY timeout for both TEAMS ...(1.0) Malone ... Payton ... O'Neal .. Bryant and Fisher .. for the Lakers ...(0.9) FOUR on the clock**	
0:46:58	5:32	MIKE:	**...(1.5) the play was DESIGNED for Desmond Ferguson they're waiting for him to clear SEVERAL picks and ...(1.6) Kobe Bryant ...(2.2) er excuse me Gary PAYTON was on Desmond Ferguson and ... now Ferguson will get his chance to play Gary PAYTON that's ... I'm SURE only happened in videogames in his house BEFORE ... now he gets his CHANCES**	
0:47:15	5:15	STEVE:	**... he killed him** @@@@@ @	
0:47:18	5:12	MIKE:	**... KOBE for three ...(1.2) OFF the mark ... rebound Stoudamire ...(2.7) you know we see all these lineups for PORTLAND and these players that don't normally PLAY and ...(1.5) <it's> -- ... it's got a strange FEELING the game does .. and imagine for the LAKERS it's kinda strange feeling as WELL .. as it's been a lot of FUN here at the Rose Garden but ...(1.0) this game means a LOT to the Lakers ... FERGUSON a WIDE open three ... PERFECT**	
0:47:41	4:49	STEVE:	**... yep ...(0.8) it ONLY means a lot if Sacramento LOSES ...(0.9) you know and I think you're taking the APPROACH** ... last game that ...(1.0) Kobe gets <a> -- a little hip from RUBEN ...(6.0) yep ... one thing that Ferguson can DO .. he can shoot it DEEP and ... if you give him a chance to er ... get a good look down and he's gonna drop it IN ... he's out of the	*rep*

			ballgame and Rahim as WELL as MILES ... and Zach Randolph coming back IN	
0:48:10	4:43	MIKE:	...(1.4) Ferguson three for EIGHT now .. from behind the arch in his .. young Blazer career	
0:48:13	4:43	STEVE:	... well you just SAW **that both BENCHES are INVOLVED in this game and ... the reason FOR it .. are liberal doses of TIME and er ... NOT a lot of the .. TENSION .. you know it's the LAST game what you gonna do coach ... the hold that gets me all year LONG ... BRYANT ... first two here in the second**	
0:48:34	4:24	MIKE:	**...(6.0) Blazer lead is FIVE .. they have led THROUGHOUT ... by as many as EIGHT ...(2.8) Zach ...(0.9) against Karl Malone ... Darius Miles .. the CUTTER ... NICE PASS** down to PATTERSON he SCORES and he's FOULED ...(1.1) a good BALL movement by PORTLAND .. went inside to MILES and he found PATTERSON <u>on the BASELINE</u>	*rep*
0:48:53	4:14	STEVE:	...(1.4) <u>and you get him RIGHT inside ... DEEP in the slot .. and this is ... you know ... a VERY good place for a PLAYER to PLAY ... if someone will throw him the BALL ... because the defense has the tendency</u> to be looking OUT at whoever HAS the ball	
0:49:14	4:14	MIKE:	**...(10.4) Ruben LONG with the ... three point ATTEMPT ...(1.4) three point PLAY opportunity that is ...(2.1) Blazer lead is SEVEN .. here is KOBE ...(2.2) Gary PAYTON will take an occasion of THREE .. this one is SHORT ...(1.0) but [he tracks]**	
0:49:29	3:59	STEVE:	**[one of]**	
0:49:30	3:58	MIKE:	**(0) down his own REBOUND**	
0:49:30	3:58	STEVE:	**... ONE of the thing that Portland HASN'T done well tonight is REBOUND the ball ... they've given the Lakers ... TOO many CHANCES ...(1.0) Patterson .. and Miles out in a BREAK ...(2.9)** DIDN'T quite have control of it .. Zach Randolph had an easy two on the other side	
0:49:48	3:48	MIKE:	**...(3.4) you know and Ruben was being HOUNDED in the break by Gary PAYTON ... and Ruben never ...(1.2) really had a clean hold of that ball as WELL so ... NOT a good executed three on two fastbreak from Portland here is PAYTON against Miles ...(2.0) finds Karl MALONE ...(0.9)**	

			that went off TOO ... Patterson and REBOUND ... Portland ... runs AGAIN ... three on THREE ...(1.8) Stoudamire had it poked AWAY got it BACK and SCORES ...(5.1) Portland on top by NINE ... this is their largest LEAD of the game ...(5.3) and Phil JACKSON ... wants timeout ... he's not HAPPY with his Lakers TROOPS ...(1.1) three THIRTEEN <u>left in the first HALF ...(1.3) Blazers on TOP by nine ...(3.8)</u>	*rep*
0:50:38	TO	0:52:32	((COMMERCIAL BREAK – LAL TEAM TIMEOUT: REGULAR))	
0:52:32	3:13	MIKE:	well the BLAZERS against the San Antonio SPURS ... a couple of NIGHTS ago made TWENTY four field goals for the entire GAME ... they've got NINETEEN ...(0.9) right NOW .. as you take a look at the field goals for this QUARTER ... Portland sixty two PERCENT	
0:52:43	3:13	STEVE:	... well ... Portland er .. have REALLY having a good time playing TONIGHT and ... are not ... FACING the same kind of STIFLING defense maybe you say it's the last game of the SEASON but ... SAN Antonio is .. PUTTING this WOOD ... to @DENVER right now .. they're ahead by twenty EIGHTY three to SIXTY three .. so ... THEY don't like ANYBODY ... PLAYING .. and SCORING against them	
0:53:03	3:13	MIKE:	...(1.1) Popovich probably UP ... **YELLING on the bench ... SCREAMING at his players and keeping them ... TUNED UP**	
0:53:09	3:09	STEVE:	**...(1.8) [XX]**	
0:53:09	3:09	MIKE:	**[and THAT] was NOT ...(1.2) great DEFENSE**	
0:53:12	3:06	STEVE:	**... well OUT of the timeout everybody went to SLEEP ... and er .. you know that's what HAPPENS sometimes that you COME out .. you ... you're THINKING they're not really RUNNING the play what's SHAQ doing way outta HERE ...(2.5) nice pass from Karl MALONE ... to the OPEN .. Kobe BRYANT**	
0:53:30	2:47	MIKE:	**...(5.0) Patterson .. try to give it in to ZACH ... somehow Zach got it BACK ... CHALLENGES O'Neal MISSED the lay in...(6.2) Karl Malone open Blazers CONFUSED on DEFENSE and ...(0.9) Theo Ratliff trying to get**	

			SOMEBODY to go out on Karl MALONE and just like THAT .. the lead is down to FIVE
0:53:49	2:28	STEVE:	**... well .. that's the first field goal tonight FOR ... Karl Malone he was O of FOUR to THAT shot ...(0.8) Gary PAYTON has not made a field goal .. in this ballgame YET**
0:54:00	2:17	MIKE:	**...(3.1) Stoudamire working against Derek Fisher who's hounded him IN ... Damon now OPEN on to Zach PICK ... drops it DOWN**
0:54:07	2:10	STEVE:	**...(1.3)** @@@@
0:54:08	2:09	MIKE:	**... Fisher not ... @HAPPY about the PICK applied by ... Zach Randolph a little more like PASS blocking than an actual set PICK but ...(3.3) Payton ALL the way down the FLOOR .. NOBODY stops BALLING he LAYS it in**
0:54:23	1:54	STEVE:	**...(1.6) the LAST three possessions .. the Trailblazers have NOT been .. AWAKE or AWARE .. of what's going on with the GUY with the BALL ... and they've had people scoring ... AT WILL**
0:54:37	1:42	MIKE:	...(5.5) they call a CARRY on Stoudamire on TOP but you SEE ...(0.9) and you talked about this a LOT ... did you SEE what HAPPENS ... when somebody decides to come out and pressure ... the BALL .. as you take a look at Karl Malone's ...(1.3) SHOES ...(1.2) **HOLY cow**
0:54:53	1:38	STEVE:	**...(1.8) you don't WANT a pair?**
0:54:54	1:37	MIKE:	**... NO**
0:54:55	1:36	STEVE:	**...(0.9)** @
0:54:57	1:34	MIKE:	**...(2.4) I COULDN'T @wear @those ... Bryant INSIDE ... HIS floater is IN and ... boy ...(1.5) take the ball right INSIDE the Blazer DEFENSE right NOW .. the doors are wide OPEN**
0:55:08	1:23	STEVE:	**...(1.0) well ... they've RELAXED ... and er ... we find out whether they ... er .. reinvigorate themselves at the ... defensive END ... as it is now .. a three point GAME ... looking for Miles**
0:55:19	1:12	MIKE:	**...(1.4) Darius had a twelve quick POINTS been quiet SINCE .. <X who X> Zach ...(2.5) Damon with FIVE to shoot goes past SHAQ ...(1.1) throws it up missed the SHOT ... RATLIFF the offensive BOARD ...(4.6) Damon working left ELBOW ... finds PATTERSON from ten feet**

			that's LONG ... rebound kept alive by Ratliff AGAIN ...(0.8) THIRD opportunity for PORTLAND ...(2.2) forty five seconds left first HALF .. Zach turns on Karl MALONE .. now FADES a:and HITS ...(17.2) foul called on Ruben PATTERSON as he was defending SHAQ ...(6.3) and that was the Blazers' foul to GIVE ...(6.5) **Shaq DOUBLE team ...(1.0) Derek Fisher an open look at a THREE wouldn't TAKE it now PAYTON does in a WIDE open look at a three and is short WITH it ... Karl Malone the REBOUND** and he ROLLED his ANKLE ...(2.5) and he heads RIGHT to the LOCKER room it LOOKS like ... as Karl Malone is LEAVING the FLOOR ...(1.2) and that is NOT what the Lakers NEED at THIS point .. obviously	
0:56:45	0:18	STEVE:	<u>... WELL you never wanna see anybody hurt and Malone INSIDE ... gets a good rebound POSITION ... **and comes DOWN and that ... right ANKLE goes OUT and he KNOWS it's not GOOD .. and er ...(1.1) OH ...(0.8) OH**</u>	*rep*
0:57:03	0:06	MIKE:	**...(4.0) so the Blazers a final shot OPPORTUNITY .. five seconds left .. Zach spins on MEDVEDENKO .. tough shot it's OFF .. Patterson the REBOUND** ... and PATTERSON is FOULED ...(1.3) Bob Delaney says BEFORE the HORN ... Gary Payton can't BELIEVE it	
0:57:17	0:00	STEVE:	...(1.5) on the floor	
0:57:24	0:00	MIKE:	...(6.1) unless he says Patterson was going <u>up to SHOOT .. but you said he saw it on the FLOOR</u>	*rep*
0:57:27	0:00	STEVE:	<u>... well ...(6.2) he was on the FLOOR it wouldn't MATTER and er .. RUBEN is saying YOU know</u> ...(1.0) watch OUT now ... we still GOT these	
0:57:40	0:00	MIKE:	... @@ so Portland's gonna <[GIVE]> --	
0:57:41	0:00	STEVE:	[@]	
0:57:42	0:00	MIKE:	.. get the ball at point FIVE left .. as that was the FIRST foul in the last two MINUTES ...(1.2) by the LAKERS ... and PATTERSON is trying to say I was SHOOTING the ball ...(3.0) but YOU can catch and shoot with point FIVE	
0:57:55	0:00	STEVE:	...(2.0) er ... Ruben's STILL working on his FREE throws he's trying to ... talk SOMEBODY into let him have the FREE throws and ... they're NOT ... NORMALLY ... you wouldn't get that CALL	

0:58:04	0:00	MIKE:	...(1.1) well and THIS ...(0.9) foul being CALLED on the floor not as painful as ...(0.9) the LAST that is ...(0.8) FRESH ... in the memory certainly of Blazer FANS ...(1.2) **they pass it in to MILES** and he's short with his SHOT .. and that'll DO it...(0.8) for HALF number ONE ... the Blazers shoot a high PERCENTAGE .. and hold the LAKERS to a ... LOW percentage .. and they've got a FIVE POINT LEAD ... here at HALFTIME ... <u>Blazers trying to ... win the season's SERIES from the Lakers .. for their FIRST time since ninety SIX ninety SEVEN ...(1.1) LAKERS .. wanna have a CHANCE to the Pacific Division TITLE ...(1.9) Blazers by FIVE here at HALFTIME ...(3.2)</u>	*rep*
0:58:42	0:00		((COMMERCIAL BREAK - END OF THE SECOND QUARTER))	

13.4 Transcript: Seattle Supersonics @ L.A. Lakers on FOX Sports Net

NBA Game: **Seattle Supersonics @ Los Angeles Lakers**
Date: **1/7/2003**
Location: **STAPLES Center, Los Angeles, CA**

Filename: <SEA at LAL on FOX> VHS Tape
Network: FOX Sports Net
Speakers (**SP**): **Paul** Sunderland; play-by-play
Stu Lantz;; color-commentaries

Transcript begins after a commercial break: Game time @ 8:10 in the 4th Qtr.
Transcript ends in a commercial break: Game time @ 5:45 in the 4th Qtr.

Time elapsed: Real time (**RT**): 5 min 41 secs.
Game time (**GT**): 2 min 25 secs.

RT	GT	SP	
0:00	8:10	Stu	…(1) a couple of scores from around the NBA as the Lakers lead THIS one in the fourth quarter ninety-eight to eighty ... finals from .. er a couple of other games Sacramento DESTROYED Milwaukee one o one .. to seventy-SIX …(1.9) **AND er the ROCKETS beat the Minnesota Timberwolves ninety-FOUR .. EIGHTY-six**
0:18	8:05	Paul	**…(2.2) Kenny Anderson comes into the front court guarded by Derek Fisher and speaking of that Fisher's last three point shot ... made .. or ESTABLISHED .. a new franchise record for the Los Angeles** Lakers Jerome James is fouled by Shaquille O'Neal …(1.1) the Lakers have made SIXTEEN … three point field goals in tonight's game Stu establishing a NEW franchise record
0:39	7:54	Stu	…you know ... it's funny what making shots would do for you … they know these are the same shots [BASICALLY]
0:44	7:54	Paul	[yep]
0:44	7:54	Stu	…that the Lakers have been NOT making .. er this year the previous two games they have made seven out of thirty-eight from that distance … and tonight they're making er sixteen out of twenty-SEVEN so .. nothing that a couple of made BASKETS … one TWO threer … **win LOSS and you've confidence as well**
1:00	7:52	Paul	**… Jerome James good on both free throws the Lakers lead at ninety-eight .. to eitghty-two …(2.3) wow the last couple of games two from twenty-one five percent XXX incredible tonight … KOBE**

			for an NBA record missed that that was a LONG .. three point shot …(1.8)
1:19	7:34	Stu	**yeah that was a … really long**
1:21	7:32	Paul	**… Gary Payton goes right baseline Kenny Anderson is cut off by Kobe still cut off outside to Radmanovic … Radmanovic inside to James turnaround jump-shot not close .. Kenny ANDERSON gets the offensive rebound … and the put back BASKET**
1:33	7:19	Stu	**…(1.3) oh again there's still SO much time left in this game and the Lakers are seemingly WALKING through a lot of er SOME of it at least .. and allowing the SONIC team to just … hang CLOSE**
1:45	7:07	Paul	**… (2.2) Devean George with it** looking inside to Shaq easy play to call away from the .. the ball … Jerome James fouled Shaquille O'Neal
1:53	7:07	Stu	… there there is the case again that where er when Shaquille is on the weak side … and he's trying to get erm movement across the key … he's much more effective it's much harder to defend him … keep him from get in that position
2:06	7:06	Paul	**…(1.0) into the corner to Kobe Bryant … guarded by Radmanovic Shaq comes out to set a screen Kobe around .. ten on the shot-clock … Kobe XX NBA RECORD**
2:17	6:55	Stu	**…(1.2) and you know y- OBVIOUSLY Kobe knew about the record I mean I mean SOMEBODY must've been in his ear … because HE'S thinking about that three … I guess when you've made twelve out of sixteen .. you do that**
2:28	6:45	Paul	**…(1.6) wow** … history tonight .. for KOBE BRYANT … and HOW ironic … ALL season long the Los Angeles Lakers not shooting the ball well and THERE he is
2:37	6:44	Stu	…Kobe Bryant now the leader all by himself another guy that played with Shaquille k- … Dennis **Scott had his record go by the wayside … BRIAN SHAW .. PLAYED WITH SHAQUILLE Joe Dumars George McCloud and Ray Allan … ALL with ten**
2:48	6:37	Paul	**… wow … Kobe Bryant now the** most PROLIFIC .. three point shooter …(1.4) at least for SINGLE game … FIELD GOAL MAKES …(1.6) a dozen … and even dozen … he not done yet six thirty-six remaining … and this game certainly not over …(2.1) one o one to eighty-four [it's]
3:06	6:36	Stu	[still] though you know … I'm: just amazed at how with the EASE with which he's taking the THREE X the defender forcing him to put it on the floor … I mean .. yeah obviously he can do that … as well as

			anybody if not BETTER than anybody … but you can't get HELP from JUMP shooters XXX where your teammates are … make a make a player or make or make a TEAMMATE .. the extra PASS
3:29	6:36	Paul	…(1.3) a good example of the problem that the Seattle Supersonics have had Kobe Bryant ABSOLUTELY wide hot Derek Fisher shooting the ball well Devean George as well and … nobody got enough defensively as you've been discussing Stu to really force them to help .. force them put the ball on the floor
3:44	6:36	Stu	… well it's ONE thing the way they're shooting threes with er DEREK and Devean GEORGE because … they're doing a lot of INSIDE OUT they're not just coming down and gearing up … Kobe's catching the ball .. and just STANDING there and er … GOING up … taking the shot
3:58	6:36	Paul	…(1.4) Robert Horry at the free throw line …(1.1) six thirty-six remain the Lakers looking to make it two wins in a row some good NEWS …(2.0) from Samake Walker hyper extended his left knee IS available but probably WILL not play again Stu exactly right it was his knee we feared XXX his back … probably won't see him again tonight if the lead remains .. in the neighborhood it is right now and Robert Horry with something to ADD to that **makes [both]**
4:22	6:36	Stu	**[yeah]**
4:22	6:36	Paul	**free throws**
4:23	6:35	Stu	**…with THAT though we wonder about what it's gonna do overnight … the stiffness that may come in that er hyperextension .. er hopefully there won't be any … for Samake**
4:31	6:28	Paul	**… Payton spins baseline patterned that little runner off the left side GOOD move by Gary Payton … he scores easily has fourteen the Lakers' lead is one o three to eighty-six**
4:40	6:18	Stu	**… and the glove is over there and out on Kobe @@@**
4:43	6:16	Paul	**he said ENOUGH already … ENOUGH for this madness**
4:46	6:13	Stu	**.. he should've said that in the FIRST quarter**
4:48	6:12	Paul	**(0) inside to Shaq … Shaq turns … jumpshot over Jerome James NICE play by Shaquille O'Neal**
4:54	6:05	Stu	**…(1.3) you know @@ Shaquille says JEROME you may be seven foot …(1.5) but come ON now … can you HANDLE this**
5:00	5:59	Paul	**…(0.8) Shaq now with nineteen … seven assists for Shaquille O'Neal .. Anderson pull up seventeen foot jump shot rims in and out Robert Horry's got the rebound now Kobe's with it … picked**

			up by Gary Payton … pass in to Shaq .. deflected away Shaq hustles after … Shaq pulled up fifteen foot jump shot from XXX fouled he was surrounded XXXX out the defenders
5:21	**5:45**	Stu	…@@@@@ …(2.4) well KOBE we … we chronicalled his first eleven but I tell you the LAST one is the one that put him in the record books ALL BY HIMSELF … he's got TWELVE and the Lakers leading one o five to eighty-six (1) you're watching the world champion Lakers on FOX sports net
5:41	**5:45**	---	((COMMERCIAL BREAK))

13.5 Transcript: San Antonio Spurs @ L.A. Lakers on TNT

NBA Game: **San Antonio Spurs (SAS) @ Los Angeles Lakers (LAL)**
Date: **5/11/2004**
Location: **STAPLES Center, Los Angeles, CA**

Filename: <SAS at LAL on TNT> DVD Code: J4004
Network: TNT (Turner Network Television)
Speakers (**SP**): **Marv** Albert; play-by-play
Doug Collins; color-commentaries
Mike Fratello; color-commentaries

Transcript begins after a SAS team timeout: Game time @ 8:47 in the 4th Qtr. DVD Scene: 23 @ 2:10:57
Transcript ends in a LAL team timeout: Game time @ 2:05 in the 4th Qtr. DVD Scene: 26 @ 2:31:35

Time elapsed: Real time (**RT**): 16 min. 01 secs. (4 min. 37 secs. commercial breaks excluded)
Game time (**GT**): 06 min. 42 secs.

RT	GT	SP	
2:10:57	8:47	MARV:	now this CROWD reacting ...(1.2) to the LAKERS ... who have taken a EIGHTY one ...(1.0) seventy three lead .. eight forty seven remaining ...(1.4) in this FOURTH quarter ...(1.5) Phil Jackson staying with ... (1.1) Slava Medvedenko ... Derek Fisher ... now Devean George comes OUT ... along with Shaquille O'Neal and ... Kobe BRYANT .. **who had been BRILLIANT ...(1.3) Shaq coming on .. in the SECOND half ...(1.0) Tim Duncan ... VERY .. quiet ...(0.9) in the SECOND half ...(0.8) they TRY to get him involved ...(2.3) Duncan ... WAY OFF**
2:11:38	8:28	DOUG:	**...(4.6) the Lakers were being outrebounded by TEN at half they now .. are plus one rebound that's PLUS eleven .. rebounds ... here in the second half the aggressiveness ALL L A**
2:11:50	8:16	MARV:	**...(2.0) Bryant ... met by Bowen ...(1.7) Kobe with the STEP ...(1.6) AND SCORES ... OH what a SHOT ...(1.5) a CIRCUS ...(1.0) attempt ... by KOBE BRYANT**
2:12:03	8:03	DOUG:	**... he knew what he does ... he just SPIRITS you ... he remind me so much of Michael as we've seen Nesterovic with a little jumpshot ... but MIKE ... he makes SHOTS ... against the CLOCK ... against great DEFENSE ... in PRESSURE ... and it thus then like takes the .. AIR out of you when you're the defensive team**
2:12:19	7:47	MIKE:	**... and you think you're doing a good job .. as Fisher come DOWN**

			... sees himself wide open at the FOUL LINE .. pulls up ... and hits that JUMPER	
2:12:26	7:40	MARV:	**...(1.4) Bryant has thirty .. two points ... Lakers by TEN ...(1.5) looking to TIE the series ...(0.9) at TWO ... the <X scene X> will shift back to San ANTONIO on THURSDAY night .. bodies falling all over the FLOOR ... PARKER from DOWNTOWN**	
2:12:42	7:24	MIKE:	**... you know what happened there ... they stopped him once .. they stopped twice .. they stopped him a THIRD time ... then they fell ASLEEP just for a SECOND**	
2:12:48	7:18	DOUG:	**(0)** @	
2:12:49	7:17	MIKE:	**(0) he stepped @back behind the three POINT line ... and he HITS a three**	
2:12:52	7:14	DOUG:	**... well again ... Kobe Bryant was playing the three point shooter in the corner HE was <all way> -- .. all the way in the lane .. he's not even GUARDING the guy ... off the ball**	
2:12:59	7:07	MARV:	**...(1.4) MEDVEDENKO ... for the** reverse ...(0.8) and a FOUL ...(4.3) Slava Medvedenko ...(1.4) will go to the LINE ...(4.9) foul on Nesterovic that is ... HIS third ...(4.4) Gary Payton RETURNS ...(1.8) replacing ...(1.5) Derek FISHER ...(1.1) Fisher four POINTS ... but the STORY ... tonight ... a COMBINATION ...(1.2) of Shaquille O'Neal ...(0.8) and Kobe Bryant ... they have LIFTED ... the Lakers .. who TRAILED by as many as ... ELEVEN and ... for KOBE BRYANT on a day .. that er .. saw him enter that FORMAL .. plea ... in EAGLE .. Colorado ... in his ... sexual assault case ... made it here <to>-- .. to Staples ...(1.2) **just before FIVE THIRTY ... (1.0) it's the FOURTH time that he's played on the SAME DAY that he's had a .. er .. COURT HEARING <in> -- ... in Colorado .. as it turns OUT ... he has played EXCEPTIONALLY WELL** ... ALL ... FOUR TIMES .. PARKER ... is FOULED	
2:14:11	6:56	MIKE:	...(1.5) Doug I find .. this one thing jumping out at me statistically .. DURING the regular season ... SAN ANTONIO .. NUMBER ONE in the NBA in OPPONENTS' FIELD GOAL percentage ... they HOLD TEAMS ... with just .. UNDER forty one percent ... yet .. coming INTO tonight .. the first three games ... the Lakers were shooting forty NINE percent ... tonight they shooting fifty ONE percent ... WHY is it that the Lakers suddenly are able to shoot a HIGH field goal percentage ... against the San Antonio DEFENSE	*stat*
2:14:37	6:56	DOUG:	(0) well they .. they can break it DOWN ... Kobe can play .. SCREEN	

ROLL ... they can ... roll you to the basket they can throw the ball inside to SHAQ .. who's shooting a high percentage ... **so they .. they can attack you in areas ... and when these guys are ON you can't DEFEND them ... <and> -- .. and when you -- .. again with the LAKERS .. they're shooting such a high percentage in the second HALF ... it's elevated their DEFENSE ... so it just made them that much TOUGHER**

2:14:57 6:44 MARV: **... here's BRYANT .. with the** STEP ... and he is FOULED

2:15:01 6:43 DOUG: ... that's my point right THERE .. Mike I mean here .. HE'S playing against terrific DEFENSE ... and he finds a WAY ... to tightrope on that BASELINE ... somehow GET to the basket ... and have the wear with all to get the shot to the RIM <to get two> -- .. to get TWO FREE THROWS

2:15:15 6:43 MIKE: <u>... talk about squeezing the baseline .. here it is ... a little bit of room to turn that corner against Ginobili .. here comes the next BIG MAN and then ... go UP ... draw CONTACT</u> ... go to the line *rep*

2:15:24 6:43 MARV: ... that was number FOUR ...(1.4) on Ginobili ...(3.3) Bryant nine of TWELVE ...(1.3) at the LINE .. he has ... thirty ... three POINTS ...(2.5) talking about the EXCELLENT play of .. Shaquille O'Neal and ... Kobe BRYANT .. in this ... second half ... how about Tim Duncan ... **without a FIELD GOAL ... the last thirteen MINUTES**

2:15:48 6:40 DOUG: **... that's a major CONCERN .. I mean he was averaging twenty five in San ANTONIO he a -- .. and er he and Parker combined for FIFTY in the first two GAMES** ... another TURNOVER .. TONIGHT they have combined for thirty TWO ... so the LAKERS ... have really SHUT those two guys down .. they've limited Duncan's ... field goal attempts .. **he only has taken twelve SHOTS ... they've kept Parker out of the LANE .. he has EIGHTEEN ... but it .. REALLY ... dismantled the Spurs team they're gonna have to go back to the drawing boards .. figure out how they gonna get Duncan back INVOLVED er .. Mike**

2:16:19 6:20 MIKE: **...(1.1) there's no question for SOME reason er .. they have LOST sight of the fact that THAT'S the guy they played off of for so LONG and they've gotten AWAY from his strength**

2:16:26 6:12 MARV: **... Payton coming up SHORT ... handled by ... Turkoglu ...(3.1) Turkoglu stopped by George ...(3.1) Ginobili ...(1.6) and TURKOGLU for THREE ... YES ...(1.1) HEDO TURKOGLU with ... SIXTEEN POINTS ... that's his FOURTH ... from DOWNTOWN ..**

			and the SPURS are within SIX	
2:16:50	5:49	DOUG:	**... yep .. which is a TWO possession game ... so with all the said and all the greatness of the Lakers right now .. the Spurs are right there and they're going TWO close games in San Antonio .. can they get another one tonight**	
2:16:59	5:40	MARV:	**... Bryant ... spending his way on Ginobili ... going GLASS ...(2.6) THIRTY ... SIX ... POINTS ...(1.3) WHAT an ARRAY of SHOTS we're seeing tonight from Kobe Bryant**	
2:17:10	5:29	MIKE:	**... and er that's the thing he's done it every way** ... he's done it lefty .. he's hit three pointers .. he's gotten down INSIDE the low post area ... that time a little GLASS	
2:17:19	5:27	MARV:	...(1.8) foul is called on PAYTON ... that is his FOURTH ... and a TIMEOUT taken	*rep*
2:17:24	5:27	MIKE:	... let me just create a something special HERE ... Duncan's coming OVER .. I just get it lobbed over your ARM ... and BANG IT OFF THE BOX ...(1.5)	
2:17:31	TO	2:19:50	((COMMERCIAL BREAK - TIMEOUT: OFFICIAL))	
2:19:51	5:27	MARV:	Marv Albert ... the Czar .. Mike Fratello ... Doug Collins ... Craig Sager ... back at Staples ... the Lakers .. with a ninety one eighty three LEAD ... on the SPURS ... just under five and a HALF ... remaining in the FOURTH	
2:20:03	5:27	DOUG:	... let's talk about the Lakers dominance ... in the second half .. they were down ten at HALF ... and they have come out in the second I've looked ... Kobe and Shaq have combined for thirty .. four points ... they're PLUS eleven .. rebounds after being outrebounded by TEN ... and they're shooting SIXTY .. PERCENT ... which means now they SCORE ... they GET BACK .. and they gonna LOAD UP their defense .. there IS no transition game for the Spurs ... they have to play a HALF COURT game ... the Lakers have WALKED INTO them ... and in the HALF COURT .. they have STOPPED them Mike	*stat*
2:20:35	5:26	MARV:	**...(2.5) San Antonio BALL as we ... resume ...(2.5) Duncan .. played by .. O'Neal ...(4.2)** and he's FOULED ...(0.9) Tim Duncan ... will go to the line .. to shoot two	
2:20:49	5:17	DOUG:	... Robert Horry .. on the floor right now ... to me this is a very important .. five plus minutes for Robert Horry ... if I am .. Gregg Popovich <I> -- I say to him ... LOOK ... WE brought you in here ... to	

			be a BIG PART of our team ... you gonna have to HELP us ... beat ... this Laker team ... we know you got a lot of friends on this team ... but you got .. to REALLY .. PLAY now ... like you played all season LONG especially at the end of the YEAR ... his three point shooting his defense .. HE can bring something THIS team NEEDS ... Mike	
2:21:19	5:17	MIKE:	...(1.1) yeah they .. RAVED about Robert Horry during TRAINING CAMP ... they raved about him during the SEASON .. about HOW well HOW good .. he was PLAYING ... but NOW is the time to maybe to @ .. step UP and do the things he's capable to DO .. **not DISAPPEAR**	
2:21:33	5:15	MARV:	**...(1.3) and he shot so well on the ... er series against MEMPHIS ... the Spurs taking it <in> -- ... in FOUR ... but has not .. done it ... against his former TEAM**	
2:21:43	5:05	DOUG:	**... remember he was TWO for thirty eight from the three point line last year in the playoffs**	
2:21:47	5:01	MARV:	**... BRYANT ... AGAIN ... and that's a ...(1.2) playoff career HIGH ... this SEASON ... for Kobe Bryant .. he now has thirty EIGHT .. his ALLTIME playoff career HIGH ...(0.9) FORTY EIGHT POINTS ...(4.2) ah .. I'm looking for a travelling violation on Ginobili ... Fisher** ... with the STEAL ... and a FOUL .. a retreat is CALLED ...(1.0) on ... PARKER	
2:22:13	4:41	MIKE:	...(1.9) Marv on that last pick and roll ... by Kobe Bryant ... Karl Malone ran ACROSS the floor ... and on the WHOLE way OVER he kept yelling at Kobe ... WAIT .. WAIT .. WAIT ... he SHOWED him right now ... WAIT .. WAIT i'm COMING ... sure enough he sets the SCREEN ... GETS in the space ... GIVES Kobe the look ... he responds with the BASKET	*rep*
2:22:32	4:41	DOUG:	... you can see Ginobili going under on that SCREEN .. the way Kobe is shooting the BASKETBALL now ... they're gonna have to TRAP him .. make him pass .. do SOMETHING .. but he just coming off and MEASURING it ... **he can take the ball wherever he wants to TAKE it right NOW**	
2:22:44	4:38	MARV:	**...(1.3) Lakers with a ninety three eighty four lead ...(1.1) four and a HALF ...(1.0) remaining in the FOURTH ... Bryant ...(1.8) SETS it up for Malone ...(2.0) Ginobili with the STEAL Malone HESITATED he had the SHOT ...(2.0) Turkoglu ...(1.6) good job by PAYTON getting up TIGHT on er .. Turkoglu ... preventing the THREE ...(1.2) Horry throws it back OUT ...(1.3) Parker shoots the three ...(2.2) HORRY with the rebound ... TURNS and fires ...(1.4) here comes**	

			PAYTON ... he has MALONE ahead of the FIELD ... OH he's STOPPED from BEHIND and FOULED ... by Horry	
2:23:24	4:01	DOUG:	...(0.8) now THAT'S an aggressive foul ... he HUSTLED back ... did NOT put on a play ... and KARL MALONE respects that .. because .. Karl Malone ... would do the SAME THING ... he thinks he's got a BREAKAWAY ... you COME from behind ... and you DON'T allow him to dunk that basketball	*rep*
2:23:40	4:01	MIKE:	...(2.1) you see Karl Malone HIT his HAND right now he's grabbing his finger before he steps up to the FOUL line ... so he may have <bad> -- BANGED it on the back of the RIM that time	
2:23:50	4:01	DOUG:	...(2.4) this .. this .. this game is SO like the game four last year Marv I'm NOT mistaken the Spurs had a SIXTEEN point lead ... in that game	
2:23:57	4:01	MARV:	(0) yes	
2:23:58	4:01	DOUG:	... the Lakers came back ... they WON it by four ... they evened the series at TWO two .. and went back to San Antonio ... so with ALL THAT said and done ... and tonight is over if the Lakers win the SPURS still have .. the HOMECOURT advantage ... and TWO of three in their building	
2:24:12	4:01	MARV:	...(1.2) last year San Antonio beat Phoenix .. in six in a VERY tough series then ... defeated the Lakers ... as you mentioned in SIX ... **beat DALLAS ... in six games .. in the western conference FINALS and then .. in the NBA finals ...(1.1) took out the NETS ... in six ... TEN POINT ... LAKER LEAD ...(1.1) just under four to go on the fourth .. here's Ginobili ...(1.0) the tip was MISSED ... kept alive by HORRY ...(1.9) Turkoglu from STRAIGHT away ... for THREE ... REBOUNDED by HORRY** ... and HORRY called for the OFFENSIVE foul	
2:24:49	3:38	DOUG:	...(2.1) you know AGAIN .. <I> -- .. I don't mind that .. I -- .. <if I'm> -- if I'm Gregg Popovich ... I'd like that energy ... this is the three most aggressive plays of Robert Horry's made tonight the <X HARD X> foul ... he's GOING to the offensive boards .. he DOES lower his shoulder here .. but you know what I can live with this kind of aggressiveness	*rep*
2:25:06	3:38	MIKE:	...(2.0) you know what Doug .. TIM Duncan got hurt ... somewhere in .. along the way here ... Tim Duncan has GRABBED his -- the right side of his chest <he's> -- ... HE'S gonna come out of the GAME ... I think he's got a bruised rib something on ... [here]	
2:25:17	3:38	X:	[yes]	
2:25:17	3:38	MIKE:	(0) he IS **grabbing as he walks off the floor ... he may have gotten**	

			DRILLED over a REBOUND	
2:25:23	3:33	MARV:	**...(1.5) you may recall he banged his left KNEE in a .. collision in the fourth QUARTER .. in game three on Sunday here's Bryant ... YES ... KOBE BRYANT ...(0.9) with FORTY POINTS ...(0.9) his PLAYOFF career HIGH had a forty EIGHT point game LOOK** out ... as Derek Fisher comes FLYING into our table ... are you okay?	
2:25:42	3:18	DOUG:	... TIME OUT'S [aren't even easy]	
2:25:43	3:18	MARV:	[@ @yes]	
2:25:43	3:18	DOUG:	... @@@ .. [[@@]]	
2:25:44	3:18	MARV:	[[this]] is [VERY PHYSICAL]	
2:25:45	3:18	DOUG:	[<they> -- THEY'RE] CONTESTING TIMEOUTS now Mike	
2:25:49	3:18	MARV:	...(2.5) WOW ... THREE EIGHTEEN remain@ ... in this FOURTH QUARTER ... we'll be ... RIGHT BACK ...(2.2)	
2:25:58	TO	2:28:16	((COMMERCIAL BREAK - SAS TEAM TIMEOUT: REGULAR))	
2:28:19	3:18	MIKE:	welcome back ... Lakers up twelve with three eighteen remaining we said .. Tim Duncan got hurt ... this is how it happens .. watch Karl Malone the middle of your screen ... here comes Duncan flying in for the rebound ... watch Malone's elbow right THERE ... this moment ... his elbow hits him right in the spot on -- ... rib cage area ... as result you see DUNCAN after the fact ... DOUBLE OVER ... IN PAIN ... <X SHARP X> elbow by Malone may have knocked the BREATH out of him ... there is Duncan grabbing his ... RIGHT side as he goes over to the bench	*rep*
2:28:48	3:18	MARV:	...(1.5) and guys .. things getting rough .. on the FLOOR .. and also at our BROADCAST location ... see I tried to scream dugout	*rep*
2:28:55	3:18	DOUG:	... @@@[@]	
2:28:56	3:18	MARV:	[you] were just er .. concerned with YOURSELF .. as USUAL	
2:28:58	3:18	MIKE:	... you didn't even dive in front of me to PROTECT them	
2:29:02	3:15	MARV:	**...(2.1) coming up on three minutes remaining ... in the fourth .. Lakers with a NINETY SIX EIGHTY FOUR lead here is DUNCAN ...** and he's FOULED .. hit by Malone	
2:29:11	3:09	DOUG:	... that was an angry ... play .. by Tim Duncan ... <he> -- .. he was UPSET that he got HIT ... he CAUGHT the ball .. and he had ONE thing on his mind .. Popovich RAN the play ... he said DRIVE that ball to the basket .. LOWER your shoulder ... do WHATEVER you have to	

			do ... if you have to run over somebody .. DO it
2:29:27	3:09	MARV:	...(2.3) San Antonio ...(1.2) have cut that er ... Laker lead down at THREE .. early ... in the fourth ... Lakers on a TWENTY .. eleven .. RUN ... since then ... THIRTEEN of the TWENTY scored <by> -- ... by Kobe Bryant ... this is one of the GREAT ... playoff performances of all TIME .. that we are witnessing by ... by Kobe Bryant ... as it turns out ... on a DAY ... that he SPENT ... at his pre trial **HEARING ... in Eagle ... Colorado ... HE has put up .. FORTY points ... FOURTEEN of ... twenty three ... six rebounds ... and five ASSISTS .. and he has DONE it ... with a ... VARIETY .. of SPECTACULAR .. shots ... here is BRYANT ... wanting the move on Ginobili ... and he SCORES ... make it .. FORTY .. TWO POINTS ... for KOBE BRYANT**
2:30:13	2:47	DOUG:	**... erm <he is> -- ... <he> -- he's INCREDIBLE tonight I mean you sit back and watch a performance like THIS ...(0.9) he's made every kinda shot ... that there IS**
2:30:21	2:39	MARV:	**...(1.2) FIFTEEN ... of ... the forty TWO ...(1.0) in the FOURTH ...(2.8) DUNCAN ... yes ...(1.8) so Tim ... Duncan ...(1.1) who has been VERY .. quiet .. in the SECOND half now has nineteen POINTS**
2:30:37	2:23	DOUG:	**... Marv ... Mike asked me while ago ... y'know .. <how the> -- .. how the SPURS gonna get ... into their offense ... where they gonna be -- .. how they gonna get Duncan back into the game ... in order to do that Mike .. they -- .. their DEFENSE .. as we see Kobe once again with a shot ... <they> -- .. they have FOUR steals tonight .. they forced only seven TURNOVERS <they> -- they have FOUR points in transition they were averaging EIGHTEEN points a game** in transition in San Antonio ... it's a HALF COURT game ... and the LAKERS are gonna DOMINATE a half court GAME .. cuz they gonna load UP on Tim DUNCAN
2:31:04	2:05	MARV:	...(1.0) Lakers ...(1.2) and a penalty .. Payton called for his ... fifth foul that ... FIELD goal .. incidently by Duncan .. his FIRST ... in over SEVENTEEN minutes of play
2:31:14	2:05	MIKE:	...(0.8) their GREAT players .. on CERTAIN nights ... must rise to a different level because .. the REST of their teammates JUST don't have it ... coming into this game ... COMBINED ... Shaq ... Kobe ... game one FIFTY ... game TWO FORTY SEVEN ... game THREE FIFTY ... TONIGHT .. SEVENTY ... of the NINETY eight POINTS ... by those two ...(2.6)
2:31:35	2:05		((COMMERCIAL BREAK - LAL TEAM TIMEOUT: REGULAR))

13.6 Transcript: Indiana Pacers @ L.A. Lakers on MSNBC Sports

NBA Game: **Indiana Pacers (IND) @ Los Angeles Lakers (LAL)**
Date: **6/19/2000**
Location: STAPLES Center, Los Angeles, CA

Filename: <IND at LAL on MSNBC> VHS Tape
Network: MSNBC Sports
Speakers (**SP**): **Bob** Costas; play-by-play
Doug Collins; color-commentaries

Transcript begins after a commercial break::Game time @ 8:21 in the 4th Qtr.
Transcript ends in a free throw pause : Game time @ 6:05 in the 4th Qtr.

Time elapsed: Real time (**RT**): 05 min. 56 secs.
Game time (**GT**): 02 min. 16 secs.

RT	**GT**	**SP**	
0:00	8:21	Bob	…(2.3) a sizeable crowd has gathered outside the Staples Center … hoping to CELEBRATE …(1.3) if the Lakers prevail here in game SIX …(1.8) here's the last possession for the Lakers look at Kobe Bryant … gimme the BALL … gimme the ball c'mon man are you CRAZY
0:20	8:21	Doug	@@@ .. @
0:21	8:21	Bob	(0) crazy like a FOX
0:24	8:21	Doug	(0) @@ ho HO @ …(8.1) now .. **Fox is in the game .. defensively to play against Jalen Rose … SHAW ON MILLER .. Smits' back in the game only ONE of eight .. can he master some offense for the Pacers**
0:45	8:07	Bob	**…(1.6) Indiana playing from behind for the first time since the first QUARTER … Reggie .. good-looking to three .. overshot it badly .. but Davis picks it up .. fake shot off his FEET and scores**
0:56	7:57	Doug	**…(1.4) we stop for that one Reggie had a wide open three … but Dale Davis a big second shot OPPORTUNITY**
1:08	7:44	Bob	**…(7.2) Kobe Bryant … gives it up to Fox .. cross court Horry .. out of the corner for THREE**
1:15	7:37	Doug	**…(0.9) this's amazing …(1.0) the Lakers have not shot the ball well … from the three point line .. ALL season LONG … but they've SHOT it well .. at the most** XXX time

1:27	7:28	Bob	…(1.1) it looked like an Indiana turn over … but BEFORE that .. there's a Laker foul
1:31	7:28	Doug	…well Reggie tried to come off the screen and they grabbed him so he could not get to the BALL …(2.2) it's gonna be Shaquille O'Neal …(3.1) Shaquille reaches down n' sorta GRABS him **Reggie does a good job ACTING now that's FOURTEEN fouls on the Lakers the Pacers will shoot free throws fo' the rest of the WAY**
1:52	7:21	Bob	**…(1.8) here's Dale Davis …(1.3) hacking in on HORRY …(0.8) missed IT** … and the rebound is grabbed by Shaw who's BUMPED for the foul
2:02	7:17	Doug	…(1.0) now Bob … the Pacers have to be very aware .. everytime they get into the LANE right now … Shaquille is gonna come over .. Rick Smits will be spotted out they gonna KICK that ball out to him .. and he's gonna make a couple of shots … so Shaq's not even GUARDING him right now
2:21	7:17	Bob	…(4.7) Dale Davis .. despite that miss … has played a WHALE of a game .. **FIFTEEN points .. TWELVE rebounds**
2:27	7:14	Doug	**… how about this now you had FOUR three pointers … you get FOX with one HORRY with two and FISHER … that's TWELVE points .. in a critical game to give you a five point lead**
2:36	7:06	Bob	**.. Kobe Bryant … OFF balance .. and SHAQUILLE O'NEAL is there …(10.0) the Lakers LEAD by seven …(2.2) O'Neal has scored thirty six** …(2.4) and a whistle at the other end
3:02	6:47	Doug	…(3.3) RIGHT now the difference in this game is this man right here Kobe Bryant NOT so much that he's scoring … but look what he does he COLLAPSES your ENTIRE defense … THREE guys are playing him nobody to guard SHAQ … so even though he's not shooting a HIGH percentage .. he's GETTING in the lane and breaking down the Pacer defense … what if he a .. THREE point shot or an offensive REBOUND or a HAND off to Shaquille O'Neal … so seven for twenty-two does not talk about his impact in this game
3:30	6:47	Bob	…(1.2) Brian Shaw commited the foul and before Reggie Miller went to the line Mark Jackson .. called his teammates over and HUBBLED them up … trying to STABILIZE things here there's all KINDS of time … there's a sense that the game is slipping

			AWAY but with that .. pair of free throws by REGGIE … **they're within five .. and all those seven minutes REMAINS**
3:48	6:45	Doug	**(0) well Bob they're the best three point shooting team in the league they're two three pointers away from being in the LE:AD right now**
3:54	6:39	Bob	**…(1.4) Lakers have outscored them though twenty at ten in this fourth quarter … Brian Shaw .. WILD shot .. LOOKS like a pass … I'm NOT pretty sure he KNEW that**
4:02	6:31	Doug	**… Rick Smits has gotta stop going for those SHOT BLOCKS he's not a SHOT-blocker … he's gotta stay with Shaquille O'NEAL**
4:09	6:25	Bob	… I think that was an intentional RICOCHET pass .. because Shaq was alone on the other side of the HOOP
4:14	6:25	Doug	… I think it very well COULD'VE been but that's TWICE now that Smits is going to block shots … he did the same thing in the overtime period in game FOUR .. the Lakers got two offensive rebounds .. that really changed the game but watch Rick Smits here … he is not a shot-blocker .. you don't come over try to block that shot the MVP is right THERE … you gotta keep your body on him .. make him come over the top and FOUL you
4:39	6:25	Bob	…(3.1) Rick Fox … committed the foul …(4.8) and Rose makes it one o one … to ninety-five
4:49	6:25	Doug	.. see Larry Bird's got a big decision here … Sam Perkins is gonna space the floor a little bit better … than Rick Smits .. but he's going to Rick Smits maybe to get him some offense … the problem is Rick Smits is not a good defender he can't move his FEET … he has got to do a better job right now if he's gonna be on the **FLOOR because they're not even looking for him to shoot the BALL**
5:07	6:22	Bob	**… (1.2) these games have been like EIGHTIES FLASHBACKS …(1.0) both teams in there approaching triple digits …(1.2) none of this eighty-five eighty stuff … here's HORRY again …(0.9) finally missed from that SPOT … but it pops into BRYANT'S hands … he goes up in TRAFFIC** …(1.1) and finally there's a whistle
5:28	6:05	Doug	…(1.9) Kobe .. is ELECTRIC right now … he's EVERYWHERE … he's trying SO HARD … he can't get the shots to go .. that

			was THREE efforts by him … watch as he gets the options of rebounding X himself to the lane he HANGS … FORCES it .. doesn't get it .. TRIES to get the tip .. and the lose ball foul he'll go to the line to shoot two … defensive rebounding one of the ACHILLES HEELS of Indiana ALL season long … it cost them GAME FOUR .. will it cost them a chance for GAME SEVEN
5:56	6:05	---	((FREE THROW PAUSE))

13.7 Transcript: L.A. Lakers @ Detroit Pistons on ABC

NBA Game: **Los Angeles Lakers (LAL) @ Detroit Pistons (DET)**
Date: **6/15/2004**
Location: **The Palace of Auburn Hills, Auburn Hills, MI**

Filename: <LAL at DET on ABC> DVD Code: J6005
Network: ABC
Speakers (**SP**): **Al** Michaels; play-by-play
Doc Rivers; color-commentaries

Transcript begins after a LAL team timeout: Game time @ 7:05 in the 2nd Qtr. DVD Scene: 19 @ 1:05:24
Transcript ends at the end of the 2nd Qtr.: Game time @ 0:00 in the 2nd Qtr. DVD Scene: 24 @ 1:21:50

Time elapsed: Real time (**RT**): 15 min. 48 secs. (0min. 38 secs. commercial breaks excluded)
Game time (**GT**): 07 min. 05 secs.

RT	**GT**	**SP**		
1:05:24	7:05	AL:	Palace of Auburn HILLS ...(2.3) about ten o'CLOCK ...(1.6) local TIME ... the LAKERS as play RESUMES ...(1.6) on the short end of a seven o RUN on the last one forty SEVEN .. the ...(1.4) SECOND such ... RUN in a short period of TIME ... for DETROIT ...(0.9) and an inbound with **nineteen seconds on the CLOCK ...(1.4) underneath ... Billups .. REVERSE ... PUTS it in ... to CHAUNCEY Billups ...(0.9) got it IN got it BACK and Chauncey Billups ... now has eight POINTS ...(2.0) biggest margin in the GAME ...(7.1) O'Neal's gonna DRIVE ...(1.2) too HARD ...(6.3) stolen by BRYANT** ...(1.8) and BRYANT ...(1.1) as he's moving down the COURT ...(0.9) gets FOULED ... FOULED by Tayshaun Prince	
1:06:27	6:35	DOC:	...(5.4) <I> -- ... I THINK what they're gonna DO Al <u>is say that .. Kobe Bryant ... was ... AHEAD of EVERYBODY and they're gonna give him ... a SHOT .. and a BALL ... outta BOUNDS</u>	*rep*
1:06:37	6:35	AL:	<u>...(1.1) they were near ... er .. er .. er ... CLOSE enough to a breakaway</u>	
1:06:42	6:35	DOC:	...(2.3) and there AGAIN .. on that last REPLAY ... you saw another uncontested LAYUP ... by the Detroit Pistons	
1:06:54	6:35	AL:	...(5.4) THAT is the height of frustration ... <u>you get in effect a FREE free throw</u>	*rep*
1:06:58	6:35	DOC:	<u>... yeah [and]</u>	

1:06:59	6:35	AL:	[and] you CAN'T make it	
1:07:00	6:35	DOC:	... and here it is ... you know what they're saying is ... he had a CLEAR path ... to the BASKET ... no one was in front of HIM .. he LED the pack ... so you CAN'T foul ... it's a GOOD call	
1:07:10	6:35	AL:	**... and then one of the best free throw shooters in the NBA .. can't DROP it ...(1.0) the Lakers INBOUND it ... six and a half to go first HALF ...(1.1) Bryant working off at O'Neal .. SCREEN** ... goes all the WAY ... PUTS it up ... and it DOESN'T go .. but he'll go to the LINE	
1:07:23	6:26	DOC:	... see THAT'S ... what they want Kobe .. Bryant to DO ... and that was TERRIFIC ... execution .. they SWUNG the ball to the left ... ACTING like the ball was gonna go THERE ... and then SHAQ came up from the bottom ... and gave a TERRIFIC pick ... which ALLOWS Kobe to SPLIT ... and GET into the paint ... and you can see THERE ... the FOUL on the arm	*rep*
1:07:49	6:26	AL:	...(7.4) Lakers are now three out of four from the LINE ... KOBE Bryant is the ONLY Laker ... who has BEEN to the free throw line tonight	
1:07:56	6:26	DOC:	... you know what's INTERESTING is .. Kobe Bryant ... is the ONE Laker ... that has probably been the most surpising that HASN'T gone to the line ... in this series ... **but to ME the difference is .. TONIGHT ... Kobe Bryant is not SETTLING ... HE'S attacking the basket**	
1:08:09	6:22	AL:	**... ATTACKING and of course the Lakers will tell you on the OTHER side .. they're .. just not getting the CALLS ... but the one thing Jackson DIDN'T do before this game is start to <X TAINT X> the referees through the MEDIA ...(1.0) Phil's been pretty QUIET about that over the last forty eight HOURS ...(1.7) well FORTY anyway**	
1:08:24	6:07	DOC:	**... yeah**	
1:08:24	6:07	AL:	**(0) you GOTTA say after game FOUR ...(2.2) Hamilton MISSES .. Medvedenko back in the GAME and ...(1.0) picks it off the GLASS**	
1:08:32	5:59	DOC:	**... I think Phil Jackson LIKES this switch ... with Kobe Bryant guarding Billups**	
1:08:37	5:54	AL:	**...(1.4) Bryant ... too HARD ...(1.2) Prince ...(1.3) BEHIND**	

			the back ... GREAT move to get by Bryant ... DOES it AGAIN ... and CAN'T get it to DROP ... but he'll GO to the LINE ... TWO BEHIND THE BACK DRIBBLES	
1:08:51	5:46	DOC:	...(1.6) and AGAIN ... getting ALL the way to the bucket ... EVERY long rebound ... EVERY turnover ... the DETROIT Pistons they have PUSHED the ball up ... and if YOU don't stop the BALL ... they're gonna CONTINUE to GO ... until they get ALL the way to the bucket	*rep*
1:09:10	5:46	AL:	...(7.2) Prince who grew up IDOLIZING ...(0.8) Kobe Bryant .. you know I SAY he IDOLIZES Bryant as Okur and JAMES come into the game ...(1.2) there's ONLY a couple of years ... DIFFERENTION to KOBE who's playing in the NBA so long ...(1.2) and Tayshaun Prince wanted to go into COLLEGE for four years I guess y- ... you BECOME an idol	
1:09:27	5:46	DOC:	... yeah ... you DO and Kobe became an idol pretty .. QUICKLY ... in this LEAGUE	
1:09:32	5:45	AL:	**...(2.0) there're guys in their THIRTIES who @idolize Kobe ...(1.7) seven point Detroit LEAD ...(1.2) five forty left in the HALF ...(1.8) Okur guarding ...(1.7) O'NEAL who gets it back from Medvedenko ...(1.5)** puts it UP ... gets FOULED	
1:09:51	5:31	DOC:	...(2.7) see again ... Shaq being PATIENT ... they're MOVING the ball ... they're attacking the basket ... I think one point has to be MADE ... about this FREE THROW DISCREPANCY Al ...(0.8) you know ... the Lakers er ... led the league in free throw shooting .. MOST of the league .. ALL ... YEAR ... because they LED .. most of the GAMES ... and teams went to hack a Shaq ... they've NEVER had a LEAD in this series ... so the Detroit Pistons really ... haven't had to GO to hack a Shaq ... and I think that's ONE the BIG differences ... in this series	
1:10:19	5:31	AL:	... that's an <X acclaimate X> to a purist like ...(1.3) Larry BROWN ...(1.1) as WELL he doesn't WANT to do it ...(1.2) free throw attempt DIFFERENTIAL as you can SEE ... **the difference in the FINALS as opposed to ... the REGULAR season in the first three ROUNDS .. Medvedenko got the REBOUND ... after TWO O'Neal misses ...(1.0) now BRYANT ... puts one up ...(1.0) Kobe stays COLD ...(0.9) Bryant is THREE of TEN from the FLOOR ...(5.1)** and	*stat*

			Payton tries to STEAL ... CAN'T keep it inbound	
1:10:52	5:13	DOC:	...(1.4) you know Bryant is three of TEN ...(0.9) but MOST of his shots tonight in my opinion been pretty good ... the couple of FORCED opportunities ... have led to turnovers ... I THINK as a coach you have to LIVE with those ... **because he IS so creative**	
1:11:06	5:12	AL:	**...(0.9) Pistons meanwhile are hitting FIFTY seven percent ... from the FIELD ...(1.1) and since they been GOING to the free throw line more OFTEN .. that's a tough combo to BEAT ...(0.9) and Ben Wallace is too TOUGH to beat right THERE the lead is NINE**	
1:11:20	4:58	DOC:	**...(1.8) and that's huge ... when YOU'RE Detroit ... and YOU can drop the ball in to Ben Wallace ... and get POINTS out of HIM ...** THAT is huge	
1:11:29	4:52	AL:	...(3.2) whistle on the way to the BASKET	
1:11:30	4:52	DOC:	... I mean ONE of the things Larry Brown has DONE since .. coming to Detroit ... HE'S made Ben Wallace an OFFENSIVE OPTION ... he tells his team to LOOK for him when he's on the POST ... and he's MADE Ben Wallace ... think ... OFFENSE ... Ben Wallace a couple of years ago would have NEVER ... made that MOVE ... NOW when he gets the ball he feels pretty COMFORTABLE ... and you LOOK tonight ... he's THREE for three with SEVEN points	*rep*
1:11:54	4:52	AL:	...(2.8) O'Neal makes his first free throw HERE he's now one out of THREE ...(7.2) Lakers had an EARLY seven point LEAD ...(1.0) **there's Wallace ...(0.8) tipping it to HIMSELF ... GREAT body control ... KEPT it inbound ...(0.9) a HUGE hand ...(2.0) able to PAW it ...(2.8) and now Detroit tries to CATCH it ...(0.9) Wallace ... WOW ...(7.3) FORTY four THIRTY four the LEAD is double DIGITS ...(2.8) Jackson NOT calling a timeout ... Phil believes ... in CONFLICT RESOLUTION ... they got a LOT to RESOLVE right now ...(5.0)** and Kobe got BLOCKED ... and FOULED	
1:12:50	4:15	DOC:	...(0.9) and BOY I tell you that was CLOSE ... THAT was REAL close ... as Mike James ... almost GOT there and SLID up under Kobe ...(1.9) we WATCH his FOOT ... and SEE .. if he was STILL moving at the VERY end ... he WAS@ ... that was an EXCELLENT call ... but BOY that was close ...(1.6) I	*rep*

			THINK if Mike James ... DIDN'T TRY to draw the contact HIMSELF ... he WOULD'VE had .. a <X chance X>	
1:13:16	4:15	AL:	...(2.1) Bryant now five out of SIX ... FROM the free throw line ...(13.2) **drops 'em BOTH ...(3.0) Pistons up by EIGHT ...(2.4) Fox picks up .. Prince in BACKCOURT ...(7.3) James way outside .. he provided a BIG SPARK for them ...(0.8) in just a very SHORT period of time late in the first half ... the other NIGHT ...(1.4) Okur ...(4.9) Mehmet OKUR**	
1:14:03	3:46	DOC:	**...(0.8) <and> -- .. and Medvedenko ... RIGHT now ... even though he's BEEN doing some offense ... is a DEFENSIVE liability ... for this Laker basketball team ... HE'S getting scored on ... from ALL** angles	
1:14:16	3:36	AL:	...(3.4) and a CALL here on the LAKERS ...(3.7) <that's on> -- ... THAT'S on SHAQUILLE ... so that's his THIRD .. he picked up TWO early ones ...(0.9) THIRD one ...(1.4) here AWAY from the ball	
1:14:32	3:36	DOC:	...(2.0) and so NOW we have a CRISIS ... TIME ... RIGHT now ... for the Los Angeles Lakers ... they have THREE thirty six ... they're DOWN ten points ... and they PROBABLY will **not see SHAQ ... the REST of this half ... THIS is KEY**	*rep*
1:14:48	3:31	AL:	**...(1.2) Jackson left O'Neal in in the LAST game of the Minnesota series the conference ...(1.0) FINALS ... and he picked up a FOURTH foul in the first QUARTER ...(1.1) from the CORNER ... in and out ... from Prince Medvedenko .. gets the rebound ... so O'Neal on the bench ... Malone in STREET clothes ...(5.1) FOX posting PRINCE ...(2.3) TURN around .. off the GLASS ... and Rick bangs it HOME ... to make it an EIGHT point game**	
1:15:15	3:04	DOC:	**... and RICK Fox has been BEGGING ... to play ... you know ... ONE of the points he MADE was @very INTERESTING ... he said .. hey EVERYBODY else ... is playing injured ... I would like @to play injured ALSO ... and you know ... when a PLAYER like him ASKED to come in ... it's pretty smart ... if you see Phil Jackson [let him] IN**	
		AL:	**[look out]**	
1:15:32	2:47		(0) @@@ @@ [[wow]]	
1:15:34	2:47	DOC:	[[XX]]	

1:15:36	2:47	AL:	...(1.5) <we're loo- .. look> -- ... we're look at every ... EVERY @looks way	
1:15:38	2:47	DOC:	... @ @@	
1:15:39	2:47	AL:	... COFFEE saved ... WATER saved ...(1.0) but the LAKERS are in DANGER ... Pistons lead by eight ...(5.0)	*rep*
1:15:50	TO	1:15:57	((COMMERCIAL BREAK - LAL TEAM TIMEOUT: REGULAR))	
1:15:57	2:47	AL:	Mike Tirico ... Byron Scott and Tom Tolbert upstairs .. ready to bring you the Verizon Wireless ...(0.8) HALFTIME Report ... look at Ben WALLACE ... going RIGHT by Medvedenko ...(3.2) putting one IN ... for about TEN feet and ... what Ben likes to do before the GAME as we know DOC is ... take the big ball ... take a BIGGER ball ...(1.0) and try to make BASKETS with it ... it's kinda like being out on a putting green you know you have those [TINY LITTLE] HOLES	*rep*
		DOC:	[@@]	
1:16:22	2:47		... I KNEW where you're going	
1:16:25	2:47	AL:	(0) of COURSE [[but]]	
1:16:25	2:47	DOC:	[[@]]@@@	
1:16:27	2:47	AL:	... <we> --	
1:16:27	2:47	DOC:	... @ @@	
1:16:28	2:47	AL:	... we share the same	
1:16:29	2:47	DOC:	... oh [no] doubt	
1:16:29	2:47	AL:	[MUFF]	
1:16:30	2:47	DOC:	... same PASSION	
1:16:31	2:47	AL:	... @@	
1:16:31	2:47	DOC:	(0) you know <it> -- .. it's FUNNY too .. **because THAT ball was really invented for BALL handling**	
1:16:35	2:45	AL:	**... mhm**	
1:16:35	2:45	DOC:	**(0) Ben Wallace has turned it into a ... SHOOTING gimmick but ... SOME guys DO use it for THAT ... and it's really paid OFF for 'em**	
1:16:41	2:39	AL:	**... it's working TONIGHT and ... there he is AGAIN ... BIG ball SMALL ball and THAT was after they had ... about HALF of the twenty four second clock to work with on the INBOUND ...(1.2) ten point lead .. Phil Jackson was telling**	

			us EARLIER today .. ONE of the things the Lakers HAVE to do ... was hold their TURNOVERS .. to EIGHT OR LESS ... the Lakers have ALREADY turned the ball over ... NINE TIMES ... in the FIRST HALF
1:17:04	2:19	DOC:	... a- .. and the REASON he's saying that is because HE says that they PLAY pretty good defense in halfcourt ... what they CAN'T do ... is get Detroit .. easy buckets ... and that's EXACTLY ... what they've DONE
1:17:18	2:18	AL:	...(3.1) **Cook gets doubled in the CORNER ...(1.0) nowhere to GO with it ...(1.5) four on the SHOT clock ...(0.9) out to Rush ... he's gotta SHOOT ... he does at the HORN and MAKES it ... KAREEM RUSH ... who was SO big in the ... clinching game against Minnesota with six three POINTERS**
1:17:34	2:02	DOC:	**...(1.3) boy THAT .. was a HUGE ... BUCKET ... and it was AMAZING ... how UNRUSHED .. Rush .. was ... <did> -- did THAT make sense?**
1:17:40	1:55	AL:	**(0) PERFECT**
1:17:41	1:54	DOC:	**...** @@**[**@@@**]**
1:17:41	1:54	AL:	**[DOC that's why you can't] COACH you gotta [[come BACK here next year]]**
1:17:43	1:52	DOC:	**[[**@@@@@**]]**
1:17:46	1:49	AL:	**...(2.1) from the CORNER ...(1.1) a THREE POINTER for Okur ...(1.2) big ANSWERS big ...(5.2) Bryant ...(2.6) back to Cook ... minute and a HALF to go in the period**
1:18:05	1:30	DOC:	**...(3.6) well there is NO SPACING ... RIGHT now for the Lakers ...(1.1) [and THA:T]**
1:18:09	1:26	AL:	**[and Kobe] at the LINE [[DRIVE]] one over [Okur] and Prince**
		DOC:	**[[@yes]]**
1:18:13	1:22		**[wow]**
			...(0.9) I mean their spacing there was SO bad ... you know the DIFFERENCE in the first half right now ... is it LOOKS like the Detroit Pistons' OFFENSE ... is executing to a T ... and RIGHT now the LAKERS ... are scoring almost OUT of their offense
1:18:26	1:09	AL:	**...(1.9) shot is SHORT ...(0.9) rebound keeps getting TIPPED ... winds up in the hands of PRINCE .. who's drive**

			all the WAY ...(1.3) brings the HOUSE down ...(4.6) **the Pistons in this series just EATING the Lakers up on the offensive GLASS**	
1:18:44	0:55	DOC:	... and that's X ... and ATHLETICISM coming together at the SAME time ... on that LAST possession ... the BALL stayed up in the AIR ... and they got BOTH	
1:18:54	0:53	AL:	...(1.3) twenty second LAKER timeout ...	
1:18:56	TO	1:19:03	((COMMERCIAL BREAK - LAL TEAM TIMEOUT: SHORT))	
1:19:03	0:53	DOC:	back in DETROIT ... TEN point lead .. for the Pistons ... Al THIS is what we're TALKING about ... you know a GOOD drive but watch the BALL stays up in the AIR ... and if you're LONGER .. quicker and MORE athletic ... USUALLY ... YOU come up with the REBOUNDS ... and THAT'S where the PISTONS ... have taken advantage of the LAKERS ... in this SERIES	*rep*
1:19:22	0:53	AL:	...(1.1) night after night .. FIRST time in **this series .. either teams had a FIFTY point .. FIRST half ...(3.8) Bryant PUTS one up**	
1:19:32	0:45	DOC:	**...(0.8) boy I think the Pistons LOVE when he settles ... they LOVE when he settles .. with a FADE away jumpshot ... even though it IS one of his fatal shots ... with TAYSHAUN Prince's limp ... THEY will take that shot .. ALL game**	
1:19:44	0:33	AL:	**... Pistons ... EATING up the Laker DEFENSE ...(1.7) OKUR drives ...** crosses ... PUTS it in ...(1.9) and a lead by twelve with Shaq **on the BENCH ...(0.9) Malone in CIVIS ...(3.2) and a GAME away from elimination OKUR has seven ..** Medvedenko will drive to the BASKET ... and get fouled on his way to the HOOP	
1:20:07	0:20	DOC:	...(1.5) you know <in> -- .. in a perfect world ... if you're Phil JACKSON ... you would've LOVED Medvedenko to BACK it out ... and take the final SHOT .. and just have a four point .. er ... a four second DIFFERENTIAL ... but you CAN'T pass up layups right NOW ... when you're DOWN twelve	
1:20:23	0:20	AL:	...(2.0) third FOUL on Okur ...(4.8) Medvedenko makes the FIRST ...	

1:20:30	TO	1:20:54	((COMMERCIAL BREAK - MEDVEDENKO FREE THROW 1 OF 2))
1:20:54	0:20	AL:	... Medvedenko ... trying to become the FIRST Laker apart from O'Neal and Bryant ... to go into double FIGURES .. and that's a small consolation to Phil JACKSON right now ... **<he is> -- his TEAM is gonna go into the LOCKER room ...(0.9) TRAILING ...(1.3) in a season in which they were BUILT ... to win ... THIS title**
1:21:12	0:11	DOC:	**...(1.5) and THIS year only**
1:21:13	0:10	AL:	**... because it'll be ... a different TEAM next year ...(1.7) and the Pistons right now trying to make it a dozen points if they CAN ...(1.0) and James puts it up and doesn't HAVE it ... and there only ...(1.0)** a FRACTION of a second left on the CLOCK ...(1.1) it's the largest halftime lead for EITHER team IN this series ...(0.8) the Detroit fell behind by seven EARLY ... they put Shaq on the BENCH ... they CAUGHT him ...(0.8) the lead SEESAWED a little bit .. and now Detroit with a great run in the second quarter they outscored the Lakers THIRTY to TWENTY ONE ...(1.1) and Detroit leads FIFTY five FORTY FIVE at the HALF ... we go to Stuart Scott ...(1.0)
1:21:50	0:00		((IN-STADIUM INTERVIEW BY STUART SCOTT - END OF THE SECOND QUARTER))

CURRICULUM VITAE OF THE AUTHOR

lic.phil. Claudio Hartmann, citizen of Schiers GR, born on 5 April 1979 in Chur, Switzerland.

2013/12 - present	**ETH Swiss Federal Institute of Technology, Zurich** Research Assistant at the Chair of Organization, Work and Technology
2012/4 - 2013/7	**ETH Swiss Federal Institute of Technology, Zurich** Research Assistant at the Chair of Strategic Management and Innovation
2013	**PhD Thesis in Neuro- and Psycholinguistics; Defense and Graduation** Dissertation Title: Pre-fabricated Speech Formulas as Long-term Memory Solutions to Working Memory Overload in Routine Language
2012/10 - 2013/4	**HWZ University of Applied Sciences in Business Administration, Zurich** Quality management assistant
2010/7 - 2011/6	**UZH University of Zurich, English Department** Doctoral Student on a research grant by the “Forschungskredit UZH”
2010	**HWZ University of Applied Sciences in Business Administration, Zurich** Quality management assistant
2007 - 2013	**PhD Student in English Linguistics at the University of Zurich** Recipient of the “Forschungskredit der Universität Zürich - 2010” research grant awarded by the University of Zurich
2005 - 2011	**Design Bureau DBCSC, Zurich** Co-author, translator and linguistic advisor
2005/12	**Lizentiat (Master Degree) at the University of Zurich; Graduation** Specialization in English Linguistics
2005	**Lizentiatsarbeit (Master Thesis) at the University of Zurich** Title: The Language of Sports Commentary - An Analysis of Linguistic Features of Sports Commentary on Live Television Coverage
2001 - present	**Stadtschule, Chur** Teacher of all subjects at the secondary school level
2001 - 2011	**Gewerbliche Berufsschule GBC, Chur** English teacher at the tertiary school level
2000 - 2005	**Graduate student at the Faculty of Arts of the University of Zurich** Main subject: English Linguistics and Literature 1st subsidiary subject: British- and North American History 2nd subsidiary subject: Military History
1999 - 2000	**EF International School at CalState University, Northridge, California** Academic Language Year
1992 - 1999	**Kantonsschule Graubünden (Grammar School), Chur** Eidg. Matura Typus B